

DESIGN AND FABRICATION OF AUTOMATIC TRANSMISSION FOR PHYSICALLY CHALLENGED PEOPLE

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering in Mechatronics

by

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**DEPARTMENT OF MECHATRONICS ENGINEERING
SCHOOL OF MECHANICAL ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC | 12B Status by UGC | Approved by AICTE
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600119**

MAY - 2023



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **KISHORE S.P (39090019)** who carried out the project entitled "**Design And Fabrication of Automatic Transmission For Physically Challenged People**" under my supervision from June 2022 to May 2023

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DECLARATION

I **KISHORE S.P (39090019)** hereby declare that the Project Report entitled **“Design And Fabrication of Automatic Transmission For Physically Challenged People”** done by me under the guidance of **Mr. S. VENKATESH, M.E.,(Ph.D.,)** at **SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Mechatronics

DATE: 02.05.2023

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1.

A handwritten signature in blue ink, appearing to read 'Kishore S.P.', with a long horizontal stroke extending to the right.

SIGNATURE OF THE CANDIDATE

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ABSTRACT

In our today's busy world transportation plays a major role for everyone to travel from one place to another. Mostly 90% of people will use either a car or bike for the mode of transportation. So to make the driving very much easier for them and to reduce the work effort we have concluded a project. So our project is mainly focused on eliminating the work action like accelerating, braking and also applying the clutch and even gear changing, which will be very useful for physically challenged people. So they can control all this work action by using a joystick, an arduino is connected to the joystick as well as linear actuator motor or a servo motor by making use of this the entire work process is reduced. When the joystick is moved forward to the positive y axis the acceleration will be increased by the motor connected at the end of each pedal, And when the joystick is moved backward the acceleration will be gradually reduced and when it comes to the negative y-axis the brake will be applied gradually. So the joystick which will be proportional to the motors and when comes for changing gears the same joystick is used, when the joystick reaches the forward maximum end and holded for a certain time the clutch will be engaged and the gears will be increased and the acceleration will also be increased for next gear which is programed at the arduino and when the joystick is lowered to negative y axis the gears will be reduced depending upon the speed or else we can use a separate joystick for changing gears which can be moved in the left and right direction. When the joystick is moved towards the left clutch will be applied and gears will be increased and while the joystick is moved towards right the clutch also applied and gears will be decreased. So with the use of the joystick we have reduced the major effort for physically challenged people especially for leg disabled people and makes their drive comfortable and much more easier.

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LIST OF ABBREVIATIONS

MT	Manual Transmission
AT	Automatic Transmission
LMV	Light Motor Vehicle
MMV	Medium Motor Vehicle
HMV	Heavy Motor Vehicle
AMT	Automated Manual Transmission
IMT	Intelligent Manual Transmission
DCT	Dual Clutch Transmission
LFA	Left Foot Accelerator
LCD	Liquid Crystal Display
GPS	Global Positioning System
CNC	Computerized Numerical Control
AC	Alternating current
DC	Direct Current
PLC	Programmable Logic Controller
LED	Light Emitting Diode

ABSTRACT

In our today's busy world transportation plays a major role for everyone to travel from one place to another. Mostly 90% of people will use either a car or bike for the mode of transportation. So to make the driving very much easier for them and to reduce the work effort we have concluded a project. So our project is mainly focused on eliminating the work action like accelerating, braking and also applying the clutch and even gear changing, which will be very useful for physically challenged people. So they can control all this work action by using a joystick, an arduino is connected to the joystick as well as linear actuator motor or a servo motor by making use of this the entire work process is reduced. When the joystick is moved forward to the positive y axis the acceleration will be increased by the motor connected at the end of each pedal, And when the joystick is moved backward the acceleration will be gradually reduced and when it comes to the negative y-axis the brake will be applied gradually. So the joystick which will be proportional to the motors and when comes for changing gears the same joystick is used, when the joystick reaches the forward maximum end and holded for a certain time the clutch will be engaged and the gears will be increased and the acceleration will also be increased for next gear which is programed at the arduino and when the joystick is lowered to negative y axis the gears will be reduced depending upon the speed or else we can use a separate joystick for changing gears which can be moved in the left and right direction. When the joystick is moved towards the left clutch will be applied and gears will be increased and while the joystick is moved towards right the clutch also applied and gears will be decreased. So with the use of the joystick we have reduced the major effort for physically challenged people especially for leg disabled people and makes their drive comfortable and much more easier.

CHAPTER 1

INTRODUCTION

One branch of mechanical engineering is automobile engineering. It covers the numerous auto kinds, their transmission systems' mechanisms, and their uses. The various vehicle types used to move people, cargo, etc. include automobiles. Technology is advancing quickly, and new advancements are being made daily. The majority of developments are made with everyday people in mind. Automobile is a compound word which is derived from an ancient Greek and Latin word which refers to self movable self. An Automobile is a vehicle which is not powered by a Human but rather Controlled by a Human. A vehicle has a wide range of options, including: cars, buses, trucks, bikes, etc. we all know that the first automobile was invented by karl benz in the year 1886 was a three - wheeled vehicle which was named as benz patent motor car,Model no.1 and then he later built a four wheeler car in 1891 and then later after many modification and updates changes had been made from then to as till now. In today's world an automobile is mostly dependent on types of engine, transmission system and control system and plays a major role in the mode of Transportation. Automobiles, also known as cars, are four-wheeled vehicles that are designed for transportation on roads. They are powered by internal combustion engines or electric motors, and are used for personal and commercial purposes. Automobiles have revolutionised transportation since their invention in the late 19th century, providing a faster, more convenient, and more comfortable means of travel than traditional horse-drawn carriages or bicycles. Today, automobiles are an essential part of modern life, and are manufactured in a wide range of styles and sizes to meet the needs of drivers around the world. They play an important role in transportation, commerce, and leisure activities, and have contributed significantly to the development of modern society. In early 90's (1900-1920) all vehicle consists of only manual transmission but soon after when automatic transmission was invented in 1921.Even then manual transmission had dominated till 1980's.But from late 1980's in us most people used to prefer automatic transmission because of it effortless driving and then as of till now most people prefer automatic rather than manual transmission. But people are also using manual transmission vehicles but it is comparatively lesser than manual

transmission. Yet, the creation of means for people with disabilities receives very little consideration. The notion of creating a vehicle for such a person is developed in order to integrate the disabled into society. Many of the Automobile manufacturing industries are mainly concentrated on manufacturing manual transmission and automatic transmission cars. The main duty of transmission is to transfer the power from the engine to its drive shaft and wheels, where the clutch is a device used to transmit power gathered from engine to the gearbox transmission. In a car a clutch is a very essential one and also the accelerator and braking is very much useful in a car for forward movement and stop. It will be somehow easier for a normal person to apply the accelerator, brake and clutch on its desired required place, but when it comes to handicap people or physically challenged people it is very much difficult for them. Individuals with physics issues find it extremely challenging to go from one location to another. The development of some three-wheeled automobiles partially satisfies the need for handicapped people to be able to drive easily on public roads. But for these kinds of vehicles to be driven on public roads, drivers must exert a great deal of effort. This project was admired and inspired by people who have interest and passion in driving a car, so its focused on physically challenged or handicapped people and especially for people who had lost their legs or functioning of legs but trying to drive eagerly, so it will be very much useful for them. As of the statistics till 2022 it is recorded that more than 57.7 million people are living without legs or lost their functioning of legs due to road injuries and many other transportation injuries, all these statistics data are gathered by various surveys. On focussing on this point a new idea and a small change in controlling acceleration, braking and applying the clutch and also changing the gears for a manual transmission car is focused mainly. Even though fully automated cars come to the market people may think to buy especially in our country. In Japan they had conducted a research on testing of a joystick system, but no positive outcomes had been found because the joystick interface is too delicate and small for driving at high speed. Since more modern cars are made with power steering than hydraulic ones. But some certain restrictions apply to the vehicles. By considering this point, changing some algorithms and implementing a new concept we had designed a concept. So in this paper we described how to improve the changes in manual transmission for controlling the acceleration,

braking and also changing gears with the help of the joystick. So it will be very much useful for handicap people to make their drive better and comfortable.

1.1 CLASSIFICATION OF AUTOMOBILE

- Purpose
 - Passenger Vehicle:-Cars, Bus, Taxi, etc.
 - Goods Vehicle:-Trucks, Tempos, Containers, etc.
- Fuel Used
 - Diesel Gas
 - Petrol
 - Electric
 - Steam (Not in Use)
- Capacity
 - Light Motor Vehicle (LMV) - Cars, Jeeps etc.
 - Medium Motor Vehicle (MMV) - Tempos etc.
 - Heavy Motor Vehicle (HMV) - Trucks, Tractors etc.
- Drive
 - Left Hand Drive
 - Right Hand Drive.
- Number of Wheels
 - Two Wheelers - MotorCycle, Scooter etc
 - Three Wheelers - Autoriksha.
 - Four Wheelers - Cars, Jeeps etc
 - Six Wheelers - Trucks, Lorry etc
- Transmission
 - Manual Transmission (MT)
 - Automatic Transmission (AT)
 - Automated Manual Transmission (AMT)

- Intelligent Manual Transmission (IMT)
- Continuously Variable Transmission (CVT)
- Dual- Clutch Transmission (DCT)

1.2 NEED FOR TRANSMISSION

The transmission is an essential component of a vehicle's powertrain. Without it, the engine's power would not be efficiently converted into motion, and the vehicle would not be able to drive. It is in charge of transferring power from the engine to the wheels. The transmission is a complex system of gears, shafts, and other components that work together to transfer power from the engine to the wheels. For the intended use of the vehicle, the transmission's gears must deliver the ideal balance of speed and torque. A low gear ratio, for instance, offers more torque, which makes it simpler for the car to move from a stop or up steep hills, whereas a high gear ratio offers higher speeds and better fuel efficiency on the highway. Modern gearboxes provide drivers with a variety of alternatives for managing the vehicle's speed and power through the use of automatic, manual, and semi-automatic modes of operation. Automatic gearboxes automatically change gears based on variables such as vehicle speed, engine RPM, and throttle position. These controls can be hydraulic or electronic. On the other hand, a manual gearbox requires the driver to manually engage the clutch and use a stick shift to change ratios. The driver can manually shift gears or let the gearbox shift automatically with semi-automatic transmissions, which combine the convenience of an automatic transmission with the control of a manual transmission. The transmission not only transmits power but also enables the engine to run at its most effective range of speeds. The transmission enables the engine to remain within that range by modifying the gear ratios. The engine's power and efficiency are optimised when it operates at a specific range of RPMs. Due to the engine functioning more efficiently, this enhances fuel efficiency and lowers pollutants. Overall, a vehicle's transmission is a vital part that affects the performance, fuel economy, and overall driving experience of the vehicle. To ensure dependable and safe vehicle operation, it is crucial to maintain the transmission in good condition.

1.3 NEED FOR AUTOMATION

Now a days in this busy cities every things is controlled by automobile there is nothing without automobile like for example constructing a building the building needs concrete the concrete should be mixed with sand now hear we are getting a help from a automobile for mixing the concrete like this there are many live examples between us and also the automobile make work easier like nowadays people can travel place to place easily using the automobile after the sudden rise of automobile industries in 1990s the automobile started producing more automobile cars than usual they made companies to produce more individual cars and technology as the result the year pass the competition between each companies made companies to implement new and more technology into automobile into the automobile cars the automobile is used everywhere,like as construction, transport,shipping etc, now the automobile has become a daily part of daily routine. Automation increases productivity and efficiency because it can carry out activities more quickly and precisely than people. The ability to perform more work in less time allows for enhanced productivity and competitiveness for enterprises. Because automation increases productivity while decreasing the need for manual labor, it can result in significant cost savings for organisations. This may be especially advantageous for companies with high labour expenditures.Automation can result in reliable, high-quality output, lowering mistakes and flaws in goods and services. In highly competitive marketplaces, reputation for quality and dependability can be crucial for firms. Automating repetitive or risky operations can increase workplace safety by lowering the possibility of worker injuries. Additionally, it can lessen the likelihood of workplace accidents and their related expenses, such as workers' compensation claims.

1.4 NEED FOR AUTOMATIC TRANSMISSION THAN MANUAL TRANSMISSION

After the sudden rise in automobile industries the companies started implementing new ideas and concepts in car that's how they come with the automatic is useful in many ways like the automatic is comfortable and easy to drive due to its easy driving and easy gear shifting the automatic doesn't have any gears like in regular manual transmission the automatic has only neutral,drive, park,reverse,the automatic can be driven by anyone the automatic doesn't need any gear shifting skills as like regular manual transmission. Many drivers prefer automatic

gearboxes over manual ones because of their convenience, use, and increased fuel efficiency. Drivers who use automatic transmissions can concentrate on other aspects of driving rather than worrying about manually changing ratios. They become especially helpful in congested areas or on lengthy trips where fatigue may be a factor. For rookie drivers or people with physical restrictions that make it difficult to utilise a manual transmission, automatic transmissions are also simpler to use. Additionally, they enable the engine to function within its ideal power and torque range, and some automatic transmissions have sport and manual modes that provide the driver additional control and involvement. this required only steering training only so anyone can drive it easily the automatic is very useful and helpful while driving in heavy traffic this provides more comfort while driving in the heavy traffic there are many types of transmission in automatic depend upon the preferences of the personal interest like cvt,amt,imt,dct but also automatic has many negative points like service cost,maintenance and ext but also automatic is preferred by many people. Automatic transmissions can also extend transmission life and lower maintenance costs by reducing the amount of wear and tear on the vehicle. Automatic transmissions are crucial for modern automobiles because of all these qualities, offering drivers everywhere convenience, effectiveness, and dependability and also mainly useful for Handicap people because it reduces much effort than the Manual Transmission vehicle.

1.5 MANUAL TRANSMISSION

Manual transmission is a type of transmission in which the gears are changed manually by gear lever or gear shifter by the driver of a vehicle while driving. Vehicles with a manual or standard transmission are typically called stick shifts. The term "manual transmission" refers to a type of transmission, usually referred to as a "stick shift" or "manual gearbox," that is used in cars and trucks. It enables the driver to manually shift gears using a gear stick and clutch pedal. In a manual gearbox, the driver uses their left foot to engage and disengage the clutch and their right hand to shift gears by moving the gear stick. The driver can transfer gears smoothly without damaging the transmission or grinding the gears by using the clutch pedal to momentarily detach the engine from the transmission. Given that the driver has more control over the speed and acceleration of the car, manual transmissions are renowned for offering a more enjoyable driving experience.

Since they do not need a torque converter or other hydraulic components that can reduce efficiency, they are also typically more fuel-efficient than automatic gearboxes. However, because they need more coordination and expertise to operate properly, they can be more challenging to drive, especially in congested areas or on incline roads. The driver uses a stick shift to manually change the gears as they accelerate and decelerate their vehicle. Located on the centre console, the shift lever is connected to the transmission by a linkage. Besides a stick shift, a manual transmission requires the use of a clutch pedal which is located to the left of the brake pedal. Engaging the clutch pedal disengages the clutch mechanism that is located between the engine and the transmission. Pressing down on the clutch pedal stops power going from the engine to the transmission so you can change gears. The manual transmission have five or six speed gearbox plus reverse. The manual transmission has a clutch which is used to stop powering the transmission to the drive shaft so that the drive can be able to change the gears smoothly. Comparing to Automatic The manual transmission is being used by most of the Indians due to its less maintenance cost and low car price.



Fig:1.1 : Manual Transmission Gear Knob

1.6 AUTOMATIC TRANSMISSION

As like the manual transmission cars the automatic transmission also has Accelerator pedal and brake pedal and also it has a simplified gearbox. Vehicles with automated transmissions have the ability to shift ratios without the driver having to do anything. In an automatic transmission, the computer system monitors the speed, load, and other variables using a variety of sensors before choosing the best gear ratio for the current driving situation. In contrast to manual transmission, automatic transmission merely requires the driver to switch between the drive (D) and reverse driving modes. (R). Additionally, some automatic

gearboxes have other modes including park (P), neutral (N), and low gear. (L). As like manual transmission cars automatic does not have five or six speed gearbox and also the automatic does not have clutch or clutch pedal in it. It has simplified gearbox. the manual transmission cars uses clutch to disconnect the engine from the transmission. Automatic transmission cars use a torque converter. Which allows the engine to spin somewhat independently of the transmission. Automatic transmission do have gears but the car handles most gears changes itself that's why there's no clutch pedal in the automatic transmission. Automatic gearboxes are preferred by drivers who desire a more easy and relaxed driving experience since they are often simpler to use and need less driver expertise. Additionally, because they can change gears more quickly than a manual transmission, they can increase fuel efficiency, particularly in stop-and-go traffic. Due to their complicated and detailed construction, they may, however, be less enjoyable to drive and may eventually need more maintenance and repair work. In drive mode, the gearbox automatically chooses the best gear based on the speed and load of the vehicle. The gearbox is set to shift at higher RPMs in sport mode, giving you a more aggressive driving experience. The automatic transmission can be driven by any and everyone automatic doesn't require clutch and gear shifting practice as like manual transmission and also mainly useful for Handicap people because it reduces much effort than the Manual Transmission vehicle.



Fig:1.2 : Automatic Transmission Gear Knob

1.7 DIFFERENCE BETWEEN MT AND AT

Table 1.1 : Difference Between Manual And Automatic Transmission

Sl.No	Manual Transmission	Automatic Transmission
1.	The manual car contains five to six forward gears and has one reverse gear.	While Automatic cars have six to eight gears.
2.	Manual requires more effort for driving the manual car completely.	While Automatic doesn't require any of it. The automatic is much easier to drive.
3.	The manual car gives greater performance in Acceleration but during stop and go traffic it requires driving skills.	Automatic is efficient while driving in stop and go traffic, This doesn't require that much effort while driving.
4.	Manual cars are slightly cheaper in price while compared to automatic transmission cars.	The automatic car is costlier because of its Luxuryness and comfort and effortless driving experience
5.	Manual cars have normal gear shifter in which gears will be labelled in it.	In automatic the gears will be labelled like Reverse, Parking, Drive, Neutral.

1.8 DISABILITY AND PHYSICAL ACTIVITY

Whether a person has a handicap or not, physical activity is necessary to preserve excellent health and well-being. Regular physical exercise lowers the chance of developing chronic conditions like diabetes and obesity and enhances cardiovascular health and muscular strength. Depending on the kind and extent of their handicap, people with disabilities may confront particular difficulties when engaging in physical exercise. However, many people with disabilities can engage in physical exercise and benefit from it with the right support and accommodations. A person with a physical disability is one who has a mobility or sensory limitation. Although significant, this review did not include cognitive, mental health, or developmental problems. Articles from 1980 to 2009 regarding people with

physical disabilities in this age range (excluding children and older individuals) were included in the search. Prior to 1980, research was few and mostly focused on the health advantages of physical exercise and early observations of the relationship between disability and physical activity. Additionally, we didn't include any articles about fibromyalgia, low back pain, athletes with disabilities, physical education and schooling, or physical activities. A physical or mental impairment that restricts a person's capacity to carry out daily tasks is referred to as a disability. Temporary or long-term disabilities may impair a person's movement, sensory functioning, communication skills, or cognitive ability. Limited accessibility, prejudice, and stigma are just a few of the difficulties and obstacles that come with living with a handicap. Many people with impairments, however, are able to have complete and rewarding lives by pursuing education, work, and other worthwhile pursuits. Promoting inclusion and accessibility for people with disabilities is crucial, as is fighting for their rights and equitable opportunities in all spheres of life. In order to facilitate their involvement in school, work, and other activities, it is necessary to offer accommodations and assistive technology. It also involves confronting prejudicial attitudes and stereotypes that may lead to exclusion and discrimination. So it's very difficult for people to live a normal life with the disability.

1.9 DISABILITIES IN INDIA

In India, people with disabilities encounter a variety of difficulties, such as restricted access to social services, work opportunities, healthcare, and education. There is also a lot of stigma, discrimination, and unfavourable attitudes towards disabilities, which can result in exclusion and marginalisation. With approximately 26 million people (2.21% of the population) in India believed to live with a disability, this country is grappling with a serious problem. However, due to underreporting and a lack of complete statistics, the true number may be greater. The Rights of Persons with Disabilities Act (2016) and the National Policy for Persons with Disabilities are two laws and policies in India that safeguard the rights of those who have disabilities. (2006). These regulations seek to advance accessibility, inclusion, and equal opportunities for individuals with disabilities in all spheres of society, including social services, work, and education. As of the 2011 Census, 2.68 billion people—or 2.21% of the country's 121 crores people are classified as "disabled" in India. 20% of people with disabilities have trouble moving, 19% have

trouble seeing, and the remaining 19% have trouble hearing. 8% of people in the population are multi-disabled. Additionally, the age range of 10 to 19 years has the greatest percentage of impaired individuals overall (46.2 lakh), followed by the age group of 20 to 29 years, which is roughly 16%. People with disabilities continue to experience challenges and discrimination in many facets of their life, and there are still large gaps in the application and enforcement of these regulations. India has a large population of people with physical disabilities, including those who suffer from mobility issues including paralysis, amputations, and spinal cord injuries. With an estimated 8 million individuals affected by vision impairment and 63 million people impacted by hearing impairment, sensory disorders including blindness, deafness, and hearing loss are also common in India. Children in India are disproportionately impacted by developmental disorders including autism and cerebral palsy, with the prevalence of autism spectrum disorder estimated to be between one and two percent of the population. With an estimated 2-3% of the population living with intellectual impairments, cognitive disorders, such as learning difficulties, impact a large number of people in India. The prevalence of mental health conditions such as depression, anxiety, and bipolar disorder is very high; it is thought that 7.5% of the population suffers from these conditions. There is a need for continued advocacy, education, and awareness-raising efforts to promote disability rights and improve the lives of people with disabilities in India.

1.10 DIFFICULTIES IN DRIVING CARS FOR HANDICAP PEOPLE

For many persons with disabilities, driving is a crucial component of mobility, independence, and social inclusion. It can increase access to jobs, education, healthcare, and other social activities while fostering a sense of independence. Nevertheless, depending on the kind and extent of the handicap, driving can also provide a variety of obstacles and challenges. The following are some of the challenges that individuals with impairments have when operating manual and automated vehicles. For people with mobility issues or poor coordination, driving a manual automobile demands the use of both feet and hands, which can be difficult. For people with lower limb disabilities, using the clutch pedal and changing gears might be extremely difficult. A manual car's continual use of arms and coordination makes it physically taxing to drive one. For those with poor stamina or endurance, this may be very difficult. Even while manual automobiles

may have more customization possibilities than automatic cars, they may still not be able to accommodate the unique demands of people with disabilities who need to use adapted equipment or have the controls of the car modified. There are certain nations where manual automobiles are more prevalent than automated cars, which might make it harder for people with disabilities to obtain vehicles that are acceptable for driving. But In some countries, automatic cars are less common than manual cars, which can make it more challenging for individuals with disabilities to find suitable vehicles for driving. Automatic automobiles might not allow for as much customisation as manual cars, which might be problematic for those with disabilities who need adapted equipment or control panel adjustments. It may be difficult for certain people with disabilities to use the steering wheel, brakes, and accelerator of an automobile because they have poor fine motor skills. The accelerator and stop pedals in an automobile can be difficult to use for certain people with disabilities since they may not have full use of their feet or legs. Despite these difficulties, people with impairments can still enjoy the advantages of mobility and freedom by driving. Both manual and automated automobiles may be modified with a variety of adapted technologies to suit the unique requirements of people with impairments. It is possible to install hand controls in place of the conventional foot pedals, enabling those with limited leg function or mobility issues to accelerate and brake using their hands. For people with restricted upper limb motion, steering wheel modifications like spinner knobs can be added to aid grip and control. Swivel seats, for example, are a type of seat modification that may be placed to increase access and comfort for those with restricted mobility. It is possible to modify the shifters on automatic transmissions so that those with weak hands or other physical limitations can more easily change gears. Ramps, elevators, and other accessibility features can be added to vehicles to make it easier for people with mobility issues to enter and depart the vehicle.

CHAPTER 2

LITERATURE SURVEY

2.1 HAND CONTROL TWIST AND PULL MECHANISM

Surve Sumit et al., 2017 - Modifications in the driving system of conventional car for paraplegic people : Modern automobiles have an essential twist and pull hand control system. It is a technology that makes it possible for drivers to control some aspects of their vehicle without using their feet or legs. This technology is intended to make driving a car safely and pleasantly possible for those with disabilities or mobility issues. The hand control lever, the cable, and the actuator are the three primary parts of a twist and pull system. A long, thin rod that may be pulled or twisted in different directions serves as the hand control lever. The wire that links the lever to the actuator is a flexible, strong cable. The lever's motion is converted into a particular action, such as accelerating or braking, by the actuator, a mechanical mechanism. The acceleration control is one of the twist and pull mechanism's most crucial features. This enables drivers to alter the speed of their vehicle by turning the hand control lever either clockwise or anticlockwise. The cable pulls on the actuator when the driver turns the lever, telling it to increase or decrease the engine's RPM. The speed of the automobile subsequently rises or falls as a result. As like the push and pull mechanism a new control mechanism has been made instead of the paddle shifter or the handle rod. The difference is that they implemented a throttle handle instead of the handle bar, when the handle bar is pushed towards downwards the brake will be applied gradually depending upon its downward motion, and when the handle bar gets a throttle the acceleration of the vehicle will be increased and decreased vice versa depending upon the given throttle. The twist and pull mechanism has a brake control feature as well. Drivers may now apply the brakes by bringing the hand control lever in their direction. The cable pulls on the actuator when the driver pushes the lever, signalling the braking system to engage. The automobile then slows down as a result. The twist and pull mechanism may also handle the car's turn signals, headlights, and windscreen wipers in addition to acceleration and braking. For instance, the driver can switch the turning signal on by rotating the hand control lever in the desired direction. The electrical system of the automobile receives a signal from this, which causes the

turning signal to turn on. The twist and pull mechanism is a crucial component of making automobiles accessible to those who have mobility issues or disabilities. Without moving their feet or legs, drivers may comfortably and securely control their vehicles. This is crucial for those whose lower limbs have been amputated, who are paralyzed, or who have other mobility issues that make it difficult or impossible for them to utilise standard foot pedals. It's crucial to keep in mind nevertheless that not all automobiles come with a twist and pull system. This is due to the system's unsuitability for all automobiles, especially those with manual gearboxes or powerful engines. Furthermore, putting in a twist-and-pull mechanism can be costly, time-consuming, and need major changes to the car's mechanical and electrical systems. As previously stated, it can typically only be used for automatic transmissions, but when it comes to manual transmissions, it will be very challenging to handle or control because we need to give a throttle and pull downward for acceleration and braking as well as need to change the gears in the same hand. If the hand in the throttle bar had been taken for shifting the gear, however, the acceleration or braking would be stopped, so it will be very challenging to handle the both in the same hand, In conclusion, the twist and pull mechanism is a crucial component of contemporary automobiles. Without utilising their feet or legs, drivers with disabilities or mobility issues may drive their automobiles safely and pleasantly. The device, which consists of a hand control lever, a wire, and an actuator, can manage features including headlights, turning signals, brakes, and acceleration. Although not all vehicles have a twist and pull system, it is a useful choice for those that require it.



Fig: 2.1: Hand Control Twist And Pull Mechanism

2.2 HAND CONTROL PUSH AND PULL MECHANISM

F.Z Kagzi, M.G.Makwana, et.al, 2021 - Manufacturing of Hand Operated Car Attachment for person with Disability : The hand control push and pull mechanism was generally used for handicapped people, especially people without leg or people who lost their functioning of leg. Another sort of device that helps drivers with disabilities or mobility issues drive safely and comfortably is the hand control push and pull mechanism. Although it makes use of a different kind of lever and motion, this method is comparable to the twist and pull mechanism. The hand control lever, the cable, and the actuator are the three basic parts of a push and pull system. A rod that may be pulled or pushed in different directions serves as the hand control lever. The flexible wire that links the actuator and lever is known as a cable. The lever's motion is converted into a particular action, such as accelerating or braking, by the actuator, a mechanical mechanism. The operation of acceleration and braking which will be normally done by people by means of the leg, it is now altered for physically challenged people into hand operation which will be applied through mechanical linkage. Initially the accelerator and brake are structured like pedal which can be pressed by foot, for making it easier handicap person a mechanical linkage is connected which is brought nearer to the steering wheel. So it can be operated even in hand itself, when it is pushed forward to brake will be applied gradually and when it is pulled to backwards the acceleration will be applied gradually. Controlling acceleration is one of the key purposes of the push and pull mechanism. Drivers may now change the speed of their vehicle by pushing or pulling the hand control lever. The driver moves the lever forward to accelerate, which pulls on the cable and tells the engine to rev up. The speed of the automobile is thus increased. The driver pushes the lever in their direction to brake or slow down, which pulls on the cable and activates the brakes. The automobile slows down as a result. The car's turn signals, headlights, and windscreen wipers may all be controlled by the push and pull system. For instance, the driver can push or pull the hand control lever in the desired direction to switch on the turning signal. The electrical system of the automobile receives a signal from this, which causes the turning signal to turn on. The push and pull mechanism, like the twist and pull mechanism, is crucial to ensuring that vehicles are accessible to those who have physical limitations or mobility issues. Without moving their feet or legs, drivers may comfortably and securely control their

vehicles. This is crucial for those whose lower limbs have been amputated, who are paralyzed, or who have other mobility issues that make it difficult or impossible for them to utilise standard foot pedals. It's crucial to keep in mind nevertheless that not all automobiles come with a push and pull system. This is due to the system's unsuitability for all automobiles, especially those with manual gearboxes or powerful engines. Additionally, putting in a push and pull mechanism can be costly, time-consuming, and necessitate major changes to the car's mechanical and electrical systems. So the person can control it by using a handle or paddle shifter which is available nearer to the steering wheel. It also consists of several types like push and rock mechanism, push and right angle mechanism. Even though this operation requires some concentration for driver because of controlling it in hand alone, it will be very much useful and easier for automatic transmission but when comes to manual transmission they have to apply and change gear, not only applying clutch and gear changing is difficult they have to control the gears and hand control acceleration and braking mechanism in the same hand because the other hand is controlling the steering. So controlling the steering, gear shifting, and acceleration and braking is very much difficult. It's also vital to remember that certain drivers could find the push and pull method less understandable than the twist and pull mechanism. So this mechanism will be like the previous twist and pull mechanism only with the minor changes but it will be very much useful for all people especially for physically challenged people. For certain drivers with weak upper body muscles or restricted mobility, pushing and pulling the lever may take more power than twisting and pulling. In conclusion, the hand control push and pull mechanism is another crucial component used to help drivers with physical limitations or mobility issues operate their vehicles in a secure and comfortable manner. By pressing or pulling a hand control lever, it enables drivers to operate features including acceleration, braking, turning signals, and headlights. Although not all vehicles have a push and pull system, it is a useful feature for those that require it. The optimal hand control mechanism for a driver's needs and skills should be determined in collaboration with their healthcare providers and driving instructors.



Fig: 2.2: Hand Control Push And Pull Mechanism

2.3 HAND CONTROL BRAKE AND ACCELERATOR

Surve Sumit et al., 2017 - Modifications in the driving system of conventional car for paraplegic people : Hand control brake and accelerator systems are made to make driving a car safely and pleasantly possible for those with disabilities or mobility issues. With the use of these devices, drivers may steer their cars' speed and braking distance without having to use their feet or legs. The accelerator pedal is one of the key elements of the brake and accelerator hand control system. This pedal is normally found on the driver's side of the automobile and is mechanically linked to the engine by a number of connections. The engine receives a signal to rev up the speed when the accelerator pedal is depressed by the driver. By transforming kinetic energy into heat, a vehicle brake is utilised to reduce speed. An arm, pad, and pivot attachments are the components of a typical brake pedal. The pedal is coupled to a connection that sends force and movement to the cylinder. The ideal braking system is the one that will allow the driver to bring a vehicle to stop in the shortest possible distance. In contrast, the accelerator pedal acts as a reaction force that regulates the timing of the throttle opening in response to the driver's depressing the pedal to the desired level. The quantity of air flow into the engine, which indirectly controls how much gasoline is consumed during each cycle and generates the required power, depends on the degree of throttle opening. The suggested steering system includes designs for both controls that may be used with the hand and produce the same output as foot pedals. In order to minimise accidental action of these controls, it is crucial to bear in mind the differences in movements for the accelerator and brake actuation while designing the brake and accelerator mechanisms. Because of this, the suggested

design makes use of brake and accelerator systems that are akin to those found in motorbikes. The current design uses handles to activate the carburetor throttle and the piston in the master cylinder of the brake system through cables and connections instead of foot pedals for accelerating and braking. The accelerator pedal is swapped out for a hand-operated lever in a brake and accelerator arrangement. Usually, the driver's hand can easily access this lever since it is positioned on the dashboard or the driver's side of the steering wheel. The driver's push or pull of the lever causes the engine of the vehicle to accelerate up or slow down. The brake pedal is the other essential part of the hand-operated brake and accelerator system. This pedal, which is used to slow down or stop the car, is normally found on the floor of the car. The hand-operated lever in a hand control system also takes the role of the brake pedal. Usually, the driver's hand can easily access this lever since it is positioned on the dashboard or the driver's side of the steering wheel. The car's braking system is engaged when the driver pulls or pushes the lever, slowing or stopping the vehicle. Using a hand control brake and accelerator system has a number of advantages. These systems offer a secure and pleasant method of driving for those with disabilities or mobility issues that make it difficult or impossible to use their feet or legs. Their freedom and quality of life may both increase as a result. Additionally, hand control brake and accelerator systems may be altered to meet each driver's specific requirements. The system may be set up to react to various pressure or movement levels, and the levers can be modified to meet the driver's hand size and strength. Drivers may now control and manoeuvre their cars precisely thanks to this. In addition, a variety of vehicles, including automobiles, trucks, vans, and SUVs, can be equipped with hand control brake and accelerator systems. They are thus a flexible choice for drivers who have physical limitations or mobility issues. It is crucial to remember that setting up a hand-operated brake and accelerator system can be costly and time-consuming. The electrical and mechanical components of the vehicle may need to be significantly altered, and specialised equipment, such a wheelchair lift or a spinning knob, may also need to be installed. In conclusion, drivers with disabilities or mobility issues should consider hand control brake and accelerator devices. They offer a secure and comfortable way to drive without using one's feet or legs, and they may be tailored to each driver's specific requirements. However, it's crucial to take into account the expense and difficulty of installing these systems,

as well as the requirement for specialised tools and adaptations. According to the Australian Standards of Adaptive Systems for People with Disabilities, the brake and accelerator handles were created. The hand control is adjusted to the maximum offset and force it can apply to the pedal. The brake and accelerator control lever handles may only be subjected to maximum forces of 240 N and 150 N, respectively. The optimal hand control method for a driver's needs and capabilities should be determined after consultation with their healthcare professionals and driving instructors.



Fig: 2.3: Hand Control Brake and Accelerator

2.4 HAND CONTROL ACCELERATOR RING

Drivers may use their hands to press the accelerator thanks to accelerator rings, which are made for those with little or no use of their lower limbs. Over ring accelerators and under ring accelerators are the two primary categories. A hand control device for cars called an accelerator ring, often called a "ring accelerator," is made to help drivers with physical limitations or mobility issues operate their cars. Without utilising their feet or legs, the driver may easily and intuitively regulate the pace of their car by using the accelerator ring. The accelerator ring is normally handled by the driver's hand and is positioned on the steering wheel of the vehicle. The ring may be rotated in either direction by the driver to adjust the car's speed since it is linked to the accelerator pedal of the vehicle by a number of mechanical connections or electrical sensors. The simplicity and convenience of usage of the accelerator ring are two of its key advantages. The accelerator ring may be manipulated with a straightforward hand gesture, requiring less physical effort than conventional hand control methods like push-pull or twist-pull systems. Drivers with weak muscles or restricted movement may find it simpler to control

their cars safely and pleasantly as a result. The driver only needs to move the accelerator ring in the desired direction by holding it in their hand and rotating it. The speed of the automobile may be changed by spinning the ring either clockwise or anticlockwise. Depending on the driver's inclination and skill level, the ring can be turned with either one or both hands. Additionally, each driver's specific requirements and preferences may be accommodated when designing the accelerator ring. The ring may be modified to accommodate the size and form of the driver's hand, and the sensitivity of the device can be changed to react to various pressure or movement levels. The system may then be customised by the driver to suit their unique requirements and capabilities. Under ring accelerators are located directly below (or behind) the steering wheel, whereas over ring accelerators are located directly above (or in front of) it. Acceleration may be controlled by drivers who use accelerator rings without taking their hands off the wheel. Additionally, brakes may be included into the controls. The accelerator ring's adaptability to a variety of vehicles is another advantage. The ring is adaptable to work with both automatic and manual gearbox systems and may be mounted on practically any vehicle, truck, van, or SUV. This makes it a flexible choice for drivers who need to operate a range of vehicles yet have disabilities or mobility issues. Additionally, not all drivers with disabilities or mobility issues will be able to use the accelerator ring. Drivers with limited hand dexterity may have trouble grasping and rotating the ring, and those with serious hand or wrist injuries may have trouble using it at all. An additional choice for people with restricted movement is a system operated by a joystick. With this kind of setup, the driver may use a single joystick to manage the steering, brake, and accelerator. The driver's hand or wrist can be used to operate the joystick, which can be placed on either side of the driver's seat. To sum up, the accelerator ring is a straightforward and uncomplicated hand control system that can help drivers with physical limitations or mobility issues drive safely and pleasantly. It eliminates the requirement for the driver to use their feet or legs to regulate the speed of their vehicle with a single hand motion. However, before selecting an accelerator ring as a hand control mechanism, it is crucial to take into account the cost and difficulty of installing the system, as well as the unique demands and talents of the driver.



Fig: 2.4: Hand Control Accelerator Ring

2.5 FOOT STEERING

Foot steering, a type of hand control, enables drivers to turn a car's steering wheel using their feet as opposed to their hands. Drivers who have upper body disorders or mobility issues that make it difficult or impossible for them to use their hands to steer the car often employ this technique. One of the most recent automotive adaptations for disabled drivers is foot-controlled steering. It is appropriate for those who have exceptional lower-body strength and control but little to no use of their arms. The left foot controls the steering while the right foot uses the brake and accelerator as normal. A spinning footplate is mounted to serve as the steering wheel. The principal functionalities of the vehicle may be operated without the need of an arm or hand control. To enable hands-free driving, voice-controlled secondary functions like lights, indicators, windscreen wipers, and more can be added to foot-controlled steering. There are now just a few manufacturers in Australia that provide foot controllers. The mechanical links or electrical sensors that link the steering wheel to the driver's feet make up the foot steering system. In order to turn the steering wheel left or right, the driver wears special shoes that have foot controls built into them, such as pedals or rocker switches. The driver depresses the left foot pedal to turn left, which turns the steering wheel in that direction. The driver depresses the right foot control to turn right, which forces the steering wheel to turn the other way. It is vital to keep in mind that foot steering is not always permitted and may not be appropriate for all drivers with disabilities or mobility issues. It may not be practicable for drivers who also need to use their feet to operate the car's pedals since it takes a lot of practise and training to use safely and properly. To sum up, foot steering is a hand control system that enables

drivers with upper body limitations or mobility issues to turn the steering wheel with their feet. Although it may be tailored to each driver's unique requirements and tastes, using it safely and efficiently requires a lot of practise.

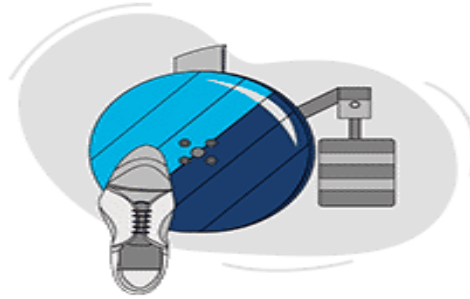


Fig:2.5 : Foot Steering

2.6 GOOGLE CAR

Most people may not have heard about that few years ago an innovation on driving a car was made and named as Google car. It has been testing its self-driving cars on public roads in several cities across the United States, including Mountain View, San Francisco, Phoenix, and Detroit. Google's self-driving cars, also known as Waymo, are autonomous vehicles that travel without a driver by using a mix of sensors, software, and mapping technologies. These vehicles have the potential to completely alter the way we travel by lowering the number of accidents brought on by driver mistake, freeing up drivers' time, and enhancing accessibility for those who are unable or unwilling to drive. The company has also partnered with several automakers, including Fiat Chrysler, to integrate its self-driving technology into commercial vehicles. Its occupancy consist of only two seats, it doesn't have acceleration or brake pedal and even it doesn't have steering wheels because it is fully automized vehicle which reduces the driver's effort to drive a car. It somehow looks like a combination of a nano car and a nissan car and contains some luggage space and only two seats. The use of self-driving automobiles may also be highly advantageous for those who are unable or unwilling to operate a motor vehicle, such as the elderly or those with impairments. Self-driving vehicles might improve access to healthcare, work, and social activities by offering a dependable and secure mode of transportation. It can be controlled by a smart phone for our pickup location and consist of a red button for any emergency stop button. Each cars consist of 15 huge cameras that can

see or can capture up to 360 degree views, so that can watch completely to avoid accident and can view at height of maximum 8.2 feet with all the feature, but these car is considered as a failure because it was limited only upto certain maximum speed of 25MPH which is approximately 40kmph, which will be good for urban area or city driving, but when compared to highway driving it is very much lesser in speed and it also can't have steering wheel to sudden change in direction, so that it meet its first accident on 14th of february but no injuries had occurred because of driving at only 2 mph but the fender and the front wheel was damaged and even later many other accident has occurred, even with the great innovation it can't be very efficient in our country because as of our population till 2022 is 1.422 billion, india is consider as 2nd most population and stats prediction tells that it will be the most population comes as on 2023. Over 90% of road traffic accidents are the major cause of mortality for those between the ages of 15 and 29, according to the World Health Organization. Self-driving vehicles have the potential to significantly reduce the number of accidents on the road by eliminating the human driver from the equation. Overall, its self-driving car technology has the potential to revolutionise the way we travel, offering greater safety and convenience while reducing traffic congestion and emissions. However, there are still regulatory and technical challenges that need to be addressed before autonomous vehicles become a common sight on our roads. So driving it in a density populated country it will be very much difficult.



Fig:2.6 : Google Car

2.7 LEFT FOOT ACCELERATOR

Left foot accelerators, commonly referred to as inversion accelerators, let drivers utilise their left foot for both the brake and the accelerator. They may be installed on cars with automatic transmissions, moving the accelerator to the left of the

brake. An adaptation known as a left foot accelerator (LFA) enables people with impairments that affect their right leg to press the accelerator pedal with their left foot. People who have had lower limb amputations, spinal cord injuries, or neurological diseases like multiple sclerosis or stroke are most likely to adopt this modification. The LFA is a pedal that is situated to the left of the brake pedal and is mounted on the driver's side of the vehicle. The driver may control the speed of the vehicle with their left foot while keeping their right foot free to depress the brake pedal thanks to the accelerator pedal's cable connection to the engine. Other drivers can operate the vehicle thanks to left foot accelerators that are available in fast release and flip up variants. There are also portable versions that are ideal for use in rental automobiles, although not all states permit the use of portable equipment. Always verify conformity with the regulatory agency in your state or territory. LFA modifications can significantly increase the freedom and mobility of people with impairments, enabling them to drive and keep their independence. Drivers who use an LFA should, however, be properly trained on the modification and how to use it safely. It's also crucial to remember that not all vehicles can have an LFA installed, so people should speak with a qualified expert to find the best solutions for their unique requirements. In many nations, including the United States, the installation of an LFA necessitates a prescription from a trained driver rehabilitation expert in addition to an assessment and referral from a licenced medical practitioner. Depending on local rules and regulations, the usage of an LFA may also need further training and certification from the driver. In general, left foot accelerators are a useful adaptation that may significantly increase the freedom and mobility of people with impairments affecting their right leg.

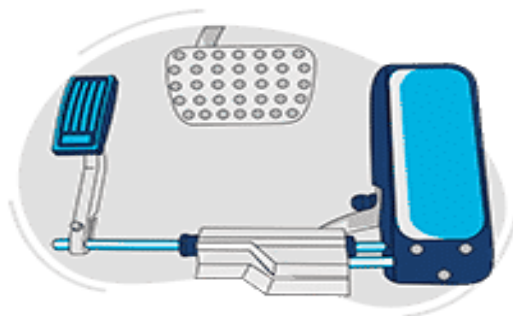


Fig:2.7 : Left Foot Accelerator

2.8 AUTO - PILOT CARS

Autonomous cars, commonly referred to as autopilot cars, are automobiles that can run without a driver. These vehicles traverse the roads and traffic, make choices, and manage the speed, direction, and other operations of the vehicle using a mix of sensors, cameras, and sophisticated software. We may have heard about Autopilot mode features which are available in aircraft which had been used for many decades, like that in cars also they have built an autopilot feature which can run the car without physical contact with the steering. The goal to boost road safety, lessen accidents brought on by human mistake, and expand mobility for those who are unable or unwilling to drive has led to the creation of autopilot automobiles. Radar, lidar, and cameras are just a few of the sensors that are included in autopilot automobiles, allowing the vehicle to "see" its surroundings and make judgements about how to traverse the road ahead. These vehicles can almost drive by themselves, but as of till 2022 fully autonomous vehicles do not exist yet and even while certain technology firms and automakers are getting even closer to make a car of completely autonomous vehicle, but they are still many years away. The data gathered by the car's sensors is processed by sophisticated software, including artificial intelligence and machine learning algorithms, which then decides how to run the vehicle. The programme can make split-second judgements that increase safety and efficiency and can adjust to changing weather, traffic patterns, and road conditions. People who are unable or unwilling to drive, such as the elderly or those with impairments, may benefit greatly from autopilot automobiles. Autopilot vehicles may improve access to social, occupational, and healthcare opportunities by offering a dependable and safe mode of transportation. The ability of autopilot vehicles to lessen accidents brought on by human mistake is one of its main advantages. Over 90% of road traffic accidents are the major cause of mortality for those between the ages of 15 and 29, according to the World Health Organization. Autopilot vehicles have the potential to significantly reduce the frequency of traffic accidents by eliminating the need for a human driver. But even if a car is completely made of autopilot mode, it will be very useful for mainly highway driving but while coming to cities or in urban areas it may have chance to produce risk of accident and so it will be very much difficult as of our countries population is very much higher so most of people uses road as a primary mode of transportation. So driving autopilot cars is very

much difficult in urban areas. While the technology for autopilot vehicles is still in its infancy, numerous businesses, like Tesla, Google, and Uber, are striving to commercialise them. We could live in a day when autopilot cars are frequently seen on our roadways as technology advances and becomes more widely accepted.



Fig:2.8 : Auto - Pilot Cars

CHAPTER 3

AIM AND SCOPE OF THE INVESTIGATION

3.1 AIM

Our project is mainly focused on converting manual transmission cars into joystick controlled car by accessing accelerator brake and clutch by the joystick which can be easily removed and can again use as manual transmission vehicle. And also it is very much efficient in automatic Transmission, but when comes to manual transmission applying acceleration, brake and changing gears and controlling the steering with 2 hands will be very much difficult because changing the gears and controlling the acceleration and braking with the same hand is difficult because other hand is controlling the steering so its very much difficult and even at some least time it may lead that to cause an accident also. To avoid all these tragedy or accident we have concluded a project which will be very much useful for handicap people especially for people without leg, because it reduces all the work which will be done by the leg like acceleration, braking and clutch applying can be controlled by the joystick and also the change in gears like increasing or decreasing can also be controlled with the help of joystick. So the huge work in gear changing in manual transmission has been minimised and these joystick and steering can be controlled very much easier even with the help of our hand itself. so we are converting it without removing the clutch pedal and most importantly without changing any transmission system. So we are developing a system which makes gears and clutches work automatically by using some servo motors which will be indicated by the help of an arduino. So by replacing it people can select by accessing a joystick for handicap people and for normal people they can even use it as manual transmission depending upon their convenience.

3.2 SCOPE OF THE PRESENT INVESTIGATION

By using this even normal manual cars can be changed into better than Automatic cars without changing the transmission only by implementing a joystick system. Even it helps physically challenged people to reduce their leg pressure for applying clutch, accelerating, braking and gear shifting work. And

also If you are using automatic transmission it will be somehow easy when compared to manual transmission for handicapped people but when we are applying this system even manual transmission would be simplified. It also reduces a lot of our work whether it is manual transmission or automatic transmission and it's especially useful for manual transmission. Even also The replacement of material or parts is very very simple and if any damage occur it will be easily detected and can be replaced easily. And also It requires only basic upkeep cares, and if any dust occurs can be easily cleanable. Even It will be very compact and easily removable and installable. And also It will be very much easier to change the gears with the joystick while compared to normal vehicle and also the speed control is also very much easier.

CHAPTER 4

MATERIALS AND EXPERIMENTAL METHOD

4.1 METHODOLOGY

4.1.1 Structure and operation

There is an in separate relationship between human beings and vehicles. It has evolved from being a normal person to a sophisticated person. Many of them will have a dream of buying the cars or even luxury cars for driving the large distance which gives them a good feeling, but it will be easy for normal people but for handicapped people its very difficult for them to a long distance and even very difficult to drive itself, and very difficult in manual cars compared to automatic cars. So to buy a new car for them its an high peak range of value, so to avoid all of that we had implemented a mechanism which will be very much useful for the physically challenged people to drive the vehicle easier even its an manual transmission vehicle. Additionally, it is very effective when using an automatic transmission. However, when using a manual transmission, applying the brake, changing gears, and controlling the steering with two hands will be very challenging because doing all of these tasks with the same hand while also controlling the steering is very challenging. At the very least, this could result in an accident. To prevent all of these tragedies or accidents, we have developed a project that will be extremely helpful to persons with disabilities, especially those without legs, because it minimises the effort that the leg will need to do for acceleration, braking, and clutch application. Our main aim is to focus and eliminate the work effort for legs by removing the work action for applying brakes, clutch, accelerator and also it eliminated the applying gears which makes all of it as compact and makes to control it by means of a joystick, so these joysticks will be very much handy and very useful to control all of these operations like applying brakes, controlling acceleration and these gears into a small system. It consist of a joystick which is connected to the arduino and the arduino is further connected to the controller and these controller are connected to the servo motors which is presented at the each pedals and these servo motors are further connected to the rack and pinions which is connected to all of these pedals and gear box, When

the joystick is pushed toward forward the acceleration of the vehicle will be gradually increased depending upon the position of joystick presented location. And when the joystick is pulled towards negative y axis the acceleration of the vehicle will be gradually reduced and the brake system will gets actuated, and the main system is that when the accelerator is increase and hold for a specific time at the end the clutch will be activated and further gears can be changed, and when the brake applied the acceleration will also reduces and at the same time the clutch will be applied and the gears will also be reduced.

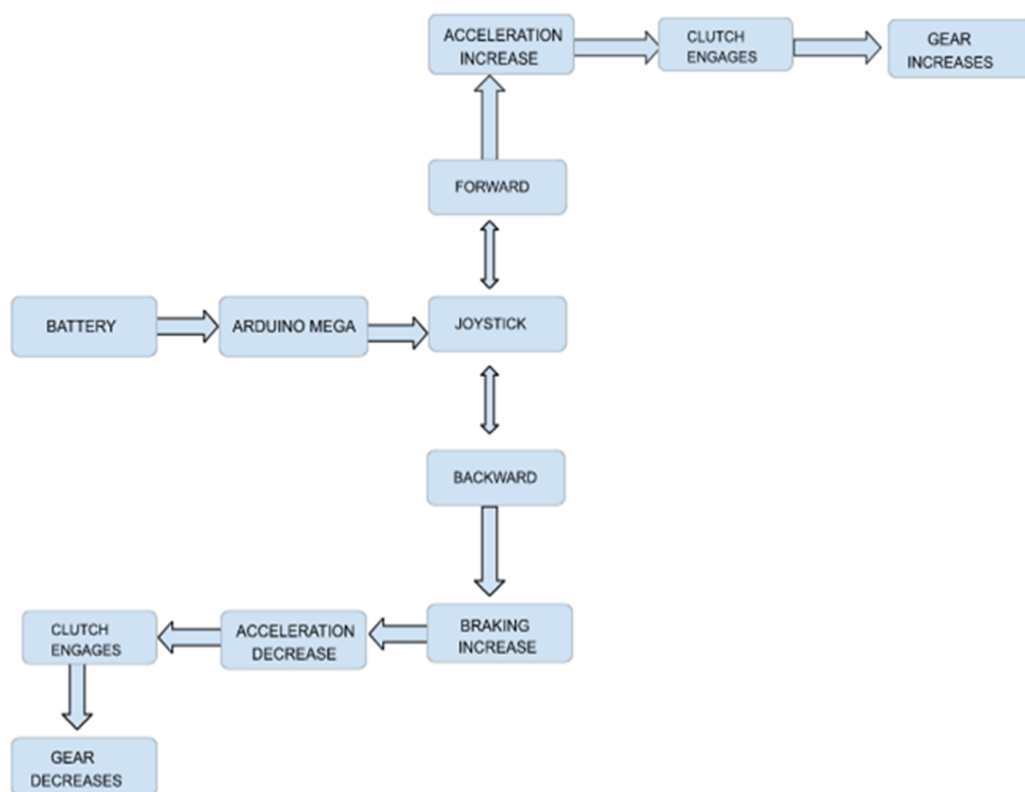


Fig: 4.1: Flow Chart of Working Methodology

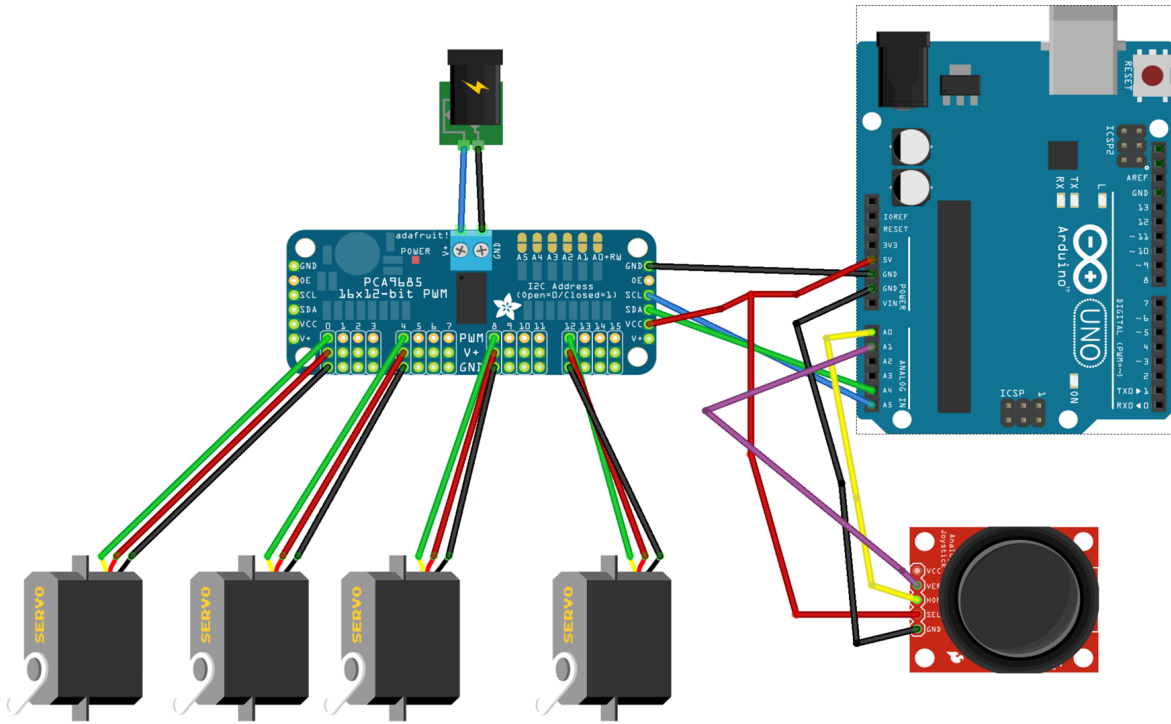


Fig: 4.2: Circuit Diagram of Joystick Control Mechanism

4.2 EXPERIMENTAL SETUP DETAILS

4.2.1 Experimental Studies

Experimental studies were conducted for the prototype, once the prototype has been fully completed and the experimental setup has been shown in the figure 4.3 and also the simulations had been shown in the figure 4.4

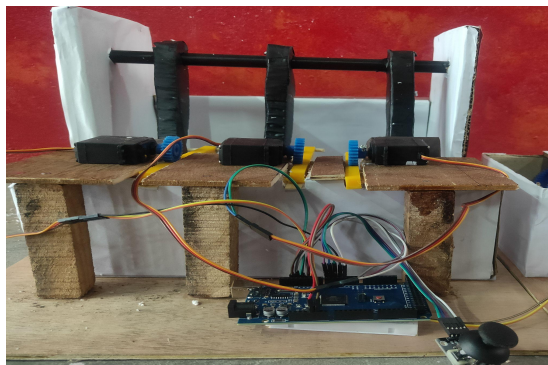


Fig: 4.3: Complete Prototype with Joystick Controller

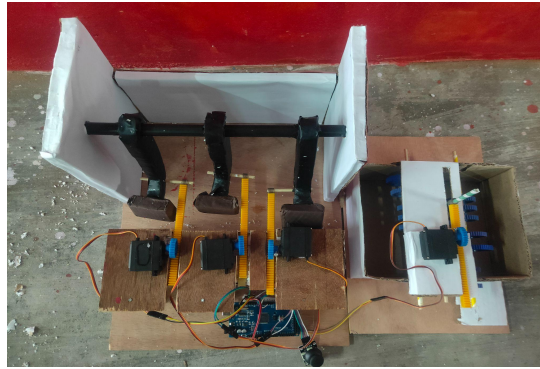


Fig:4.4 : Top View of Prototype Mechanism

The simulation of this mechanism had been made in the fritzing software, the mechanism consist of an arduino which is connected to the drive controller which is further connected to the servo motors and a joystick , these servo motors will work depending upon the movement of the joysticks which is placed at different end of pedals like accelerator, brake and the clutch. when the joystick is moved forward the servo motor placed at the accelerator will move forward, and when the joystick is hold at forward end the servo at clutch gets activated and finally when the joystick is moved at backwards the servo placed at the brake will gets activated, so like that the modification is programmed at the arduino which passes the signal depending upon the movement of joystick

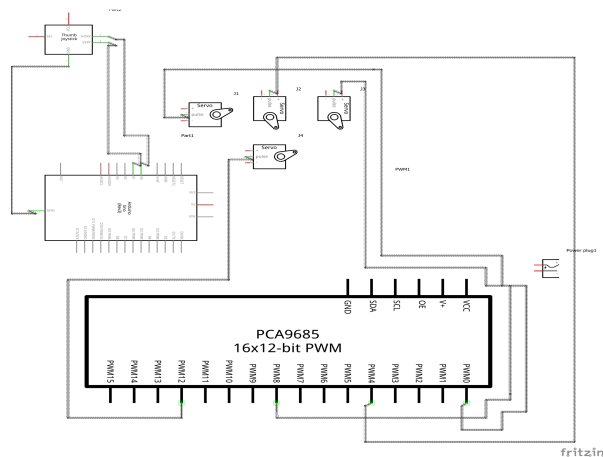


Fig:4.5 : Simulation for Joystick Control Mechanism

4.3 MATERIALS REQUIRED

- Arduino Mega
- Servo Motor (MG995)
- Rack & Pinion
- Bread Board
- Drive Controller (PCA9685)
- Lithium- ion Battery.
- Dual Axis Joystick
- Dc Motor
- Pedals
- Connecting Rod

4.3.1 Arduino Mega

The ATmega2560 microprocessor is the foundation of the Arduino Mega microcontroller board. One of the most well-known and potent boards in the Arduino family, it is made for sophisticated and complex applications that need a lot of input/output (I/O), computing power, and memory. The board has a USB connection for programming and communication, along with 4 UARTs, a 16 MHz quartz crystal, 16 analogue inputs, and 54 digital input/output ports. Mega is better than anything when compared to arduino nano & uno. A broad variety of sensors, actuators, and communication modules, including LCD displays, RFID readers, GPS modules, Ethernet shields, and Wi-Fi modules, are compatible with the Arduino Mega board. The Arduino software, which is based on the C++ programming language and has a user-friendly interface for creating, uploading, and debugging code, may be used to programme it. The open-source hardware and software of the Arduino Mega board is one of its main benefits. As a result, there is a large community of developers and fans who publish their ideas and code online, and the design and schematics of the board are freely available for anybody to alter and enhance. Due to its great learning, experimentation, and prototyping capabilities, the Arduino Mega board has been a key factor in the development of the maker movement and DIY electronics. All things considered, the Arduino Mega is a strong and adaptable microcontroller board that provides a variety of features and capabilities for challenging and intricate applications. It serves as an excellent platform for invention, experimentation, and education in

the fields of electronics and computers because to its open-source architecture and interoperability with a large ecosystem of sensors and modules.



Fig:4.6 : Arduino Mega

4.3.2 Servo Motor

An electric motor having high precision control over its output torque, rotational angle, and speed is called a servo motor. It is a kind of rotary actuator that is frequently employed in a range of industrial applications, including robotics, CNC machines, and automation systems, that call for precise motion control. A servo motor's rotor, stator, and feedback control system make up its fundamental construction. The motor's rotating component, the rotor, is attached to the device that has to be operated or the load. The windings that produce the magnetic field are located inside the stator, which is the section of the motor that is stationary. A controller compares the feedback with the required values and modifies the motor output as necessary. The feedback control system is made up of sensors that give feedback on the position, speed, and torque of the motor. Using servo motors in industrial applications has several benefits, including high precision control, high torque production, quick reaction times, and low maintenance requirements. They are also programmable, making it simple to incorporate them into automation systems and have computer programmes operate them. There are many different sizes, power levels, and types of servo motors, including AC and DC servo motors. While DC servo motors use direct current, AC servo motors are powered by alternating current. While DC servo motors are more economical at lower speeds and have greater speed control, AC servo motors have higher torque-to-inertia ratios, quicker reaction times, and smoother functioning. Robotics, CNC equipment, industrial automation, aerospace and military, medical

equipment, and automotive systems are a few examples of servo motors' typical uses. For instance, in robotics, servo motors are used to regulate the joints and limbs of the robot, whereas in CNC machines, they regulate the motion of the cutting tool. Servo motors are an essential part of modern industrial automation and robotics due to their great accuracy and programmability, which also make them an essential component in several applications requiring precise motion control.



Fig:4.7 : Servo Motor

4.3.3 Rack & Pinion

A mechanical gearing system known as a rack and pinion is frequently used to transform rotational motion into linear motion. It is a straightforward and efficient mechanism that comprises of a rotating gear (the pinion) meshing with a flat bar with teeth. (the rack). The rack moves linearly as the pinion gear rotates and meshes with it. Applications that call for accurate linear motion, such automotive steering systems, linear actuators, and robotics, frequently employ rack and pinion systems. A rack and pinion system's benefit is that it offers a quick and easy technique to transform rotational motion into linear motion with high accuracy and little backlash. In a rack and pinion system, the rack is often formed of a sturdy material with teeth cut into one side of the flat bar, such as steel or aluminium. The pinion gear is often fixed on a shaft that may be turned by a motor or other mechanical device, and it is typically built of a robust, wear-resistant material like brass or steel. The rack and pinion gear's teeth are made to mesh with a certain pitch and pressure angle, which establishes how much force is necessary to move the rack. The pressure angle is the angle at which the teeth mesh with the gear, while the pitch is the distance between consecutive teeth on the rack. High accuracy, less backlash, and small size are benefits of employing a rack and

pinion system. A cost-effective option for many industrial applications, it is also reasonably simple to construct and put together. Overall, rack and pinion systems are a significant and popular mechanical device in the area of mechanical engineering because they offer a quick and easy method of converting rotational motion into linear motion with high accuracy and little backlash. Their adaptability and effectiveness make them a popular option for a wide range of projects and designs, and they are crucial components in many industrial applications.



Fig: 4.8: Rack and Pinion

4.3.4 Breadboard

Electronic circuits may be built and tested using a breadboard, a sort of prototyping board, without the need for soldering. It comprises a plastic board with rows and columns of holes organised in a matrix, with metal sockets or clips under the holes holding components in place. Alphanumeric characters are frequently used to identify the rows and columns to make circuit design and debugging easier. The Engineers and the engineering students, and hobbyists frequently utilise breadboards to rapidly and easily test and develop electrical circuits. They make it simple to insert and remove components, allowing you to test out various circuit designs and combinations without having to permanently solder anything. Breadboards also offer a practical method of joining cables and parts, with the metal clips or sockets ensuring a reliable electrical connection. Breadboards are available in a variety of forms and sizes, some of which are tailored for certain uses such power supply, digital circuitry, or microcontroller circuits. To test and debug electrical circuits, they are frequently used in conjunction with other electronic prototyping equipment including oscilloscopes, multimeters, and function generators. One of the main advantages of using a breadboard is that it allows for rapid prototyping and experimentation, enabling designers to quickly test and modify circuit designs without the need for specialised equipment or extensive

soldering. This makes breadboards a popular tool for students and hobbyists who are just starting out in electronics, as well as for more experienced engineers who need to quickly prototype and test new circuit designs.

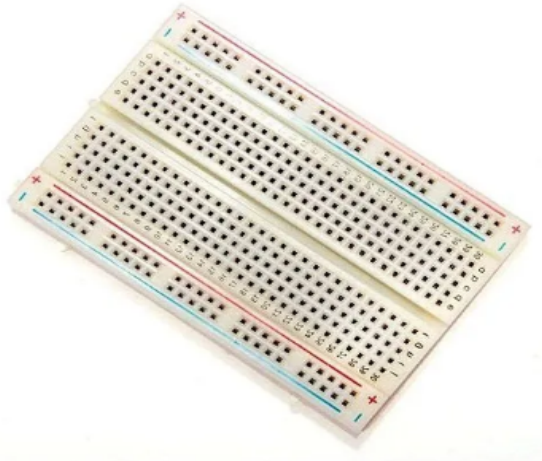


Fig: 4.9: Breadboard

4.3.5 Drive Controller (PCA9685)

An electric motor's torque, direction, and speed are all managed by a drive controller, an electronic device. Controlling the motion of various motor types, such as DC motors, stepper motors, and servo motors, is often employed in industrial automation and robotic systems. The drive controller regulates the motor's speed and direction by translating input signals from a control system, such as a programmable logic controller (PLC), into voltage or current outputs. In order to guarantee the motor operates safely and effectively, the controller also keeps an eye on a number of motor characteristics, including speed, current, and temperature. Depending on the needs of the application, the drive controller may be set up to work in a variety of modes, including open-loop, closed-loop, and vector control modes. While closed-loop control employs feedback from sensors to change the motor speed and maintain accurate control, open-loop control simply sets the motor speed depending on the input signal. The I2C (Inter-Integrated Circuit) communication protocol is used by the 16-channel PCA9685 LED driver module to control up to 16 LED outputs with 12-bit precision. It is frequently used to manage several servos, LEDs, or other devices that call for PWM (Pulse Width Modulation) signals in robotics and automation applications. The PCA9685 has an inbuilt oscillator and can function at up to 1.6kHz. Additionally, it offers configurable PWM duty cycle and frequency, enabling exact control of linked devices. The

module is compatible with well-known development boards like Arduino, Raspberry Pi, and ESP8266, and it may be controlled using a variety of programming languages and libraries.

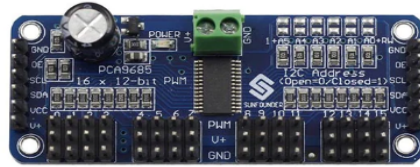


Fig: 4.10: Drive Controller

4.3.6 Dc Motor

An electric motor known as a DC (direct current) motor transforms electrical energy into mechanical energy by interacting with magnetic fields. It functions by interacting with a stationary magnetic field produced by a permanent magnet or electromagnet through the use of a magnetic field produced by an electric current running through a coil of wire (known as the armature). Which is known as the stator. The armature rotates and produces a torque that drives a load when a voltage is supplied to it. By altering the voltage or current sent to the armature, the motor's rotational speed and direction may be adjusted. Small hobby projects to large industrial machines may all be powered by DC motors, which come in a variety of sizes and power levels. The strong starting torque and precise speed control offered by DC motors, which makes them ideal for applications requiring high torque and accurate speed regulation, is one of their key benefits. They have a long service life, need little maintenance, and are also rather straightforward and trustworthy. By changing the voltage or current sent to the armature, the motor's rotational speed and direction may be adjusted. Small hobby projects to large industrial machines may all be powered by DC motors. Robotics, industrial machinery, electric cars, household appliances, and other uses for DC motors are all very popular. To give further functionality and control, they are also utilised in conjunction with other parts like gears and encoders.



Fig: 4.11: Dc Motor

4.3.7 Lithium - ion Battery

A lithium-ion battery (Li-ion) is a type of rechargeable battery that conducts its electrochemical reaction primarily using lithium ions. Li-ion batteries are commonly utilised in electric cars, grid storage systems, and portable electronic devices including smartphones, laptops, and tablets. Li-ion batteries are a popular option for many applications because they offer a better energy density and a longer lifespan than many other types of rechargeable batteries. They can keep a charge for extended periods of time without needing to be recharged since they have a lower self-discharge rate than conventional batteries. A separator that keeps the two electrodes from contacting one another is often included in the building of a Li-ion battery together with a positive electrode (cathode) and a negative electrode (anode). During discharge, lithium ions flow from the cathode to the anode, and during charging, they reverse directions. A lithium salt that has been dissolved in an organic solvent normally serves as the electrolyte in a Li-ion battery. Li-ion batteries' high energy density, which enables them to store a lot of energy in a relatively compact and light packaging, is one of their key advantages. As certain Li-ion batteries may perform over 1000 charge and discharge cycles, they also have a longer lifespan than many other battery types.

4.3.8 Dual Axis Joystick

A sort of input device used to control movement of a machine or equipment in two dimensions is a dual-axis joystick. It comprises two potentiometers (variable resistors), which detect the location of the stick and translate it into electrical impulses, and a tiny stick or lever that may be moved in any direction. In most

cases, the joystick has two perpendicular axes, one of which controls movement in the x-direction and the other in the y-direction. A gadget, such as a robot arm or camera, can be moved by the user by varying the direction in which the joystick is moved. Gaming, robotics, and industrial control systems are just a few of the areas where dual-axis joysticks are often employed. In order to give more functionality and control, they are frequently used in conjunction with other input devices, such as buttons or switches. Dual-axis joysticks' capacity to offer accurate and simple control over a device's movement is one of its key features. They are ideal for applications that call for precise movement or placement because they provide the operator a great degree of control over the pace and direction of movement. Dual-axis joysticks come in a variety of shapes and sizes, and some versions include extra capabilities like programmed buttons or customizable sensitivity. They may be linked to a variety of gadgets, including basic microcontrollers and sophisticated control systems.



Fig:4.12 : Dual Axis Joystick

CHAPTER 5

RESULT AND DISCUSSION

We all know that There is an in separate relationship between human beings and vehicles. It has evolved from being a normal person to a sophisticated person. They have a dream of buying cars for their features of comfort and luxury and also for travelling long distances. For being a normal person it will be very easy but for a handicapped person it's difficult. So to buy a new car for them it peaks to higher value. So some modification also came in cars in driving system of conventional manual transmission vehicle like push and pull, twist and pull mechanism like that some features came to control the desired application by reducing the effort especially for leg disabled handicap people, And also it is very much efficient in automatic Transmission, but when comes to manual transmission applying acceleration, brake and changing gears and controlling the steering with 2 hands will be very much difficult because changing the gears and controlling the acceleration and braking with the same hand is difficult because other hand is controlling the steering so its very much difficult and even at some least time it may lead that to cause an accident also. A automobile with a joystick-controlled manual gearbox could have benefits including enhanced ergonomics, easier operation, and more control over the car. This may be especially useful for people with impairments or restricted mobility who would find it challenging to shift gears in a conventional manual transmission. The ability to drive the car more precisely and accurately is another benefit of joystick control, which may result in more seamless gear changes and improved overall driving performance. This could be particularly crucial for high-performance cars or in circumstances that call for precise control, such in racing. The Result from the study shows that it will be very much useful for physically challenged people to actuate the vehicle very much easily, this concept is like altering or giving some more modification in the existing work. In the previous or existing work they had implemented the twist and pull mechanism and push and pull mechanism and many other mechanism to reduce the work of acceleration braking and the clutch application, but it is complex because when it is used in automatic vehicles it will be very much useful but when coming to manual transmission gears need to be applied on the same hand and in

other hand the steering will be controlled, but here in the push and pull or in the twist and pull mechanism they also need to control the acceleration, braking, clutch and also even changing gears in the same hand because on the other hand steering wheel will be handled so it will be very very difficult, so to make the process easier a joystick is placed to acquire the action of the acceleration and braking application and also the gear changing. It consist of 2 axis x and y joystick so whenever the joystick is pressed or pushed forward the acceleration will be increased gradually at a certain limit and when its reached its end and holded for a specific period of time like 3-4 sec the joystick acceleration will be further increased this will be controlled by connecting a driver which acts like a controller which is further connected to the arduino, this arduino will send the signal to the linear motor which is placed or connected to those three pedals. So when the joystick is moved backwards the acceleration will be decreased and gradually the vehicle speed and the gears will be reduced and further brake will be applied gradually, so whenever the gear is increased or reduced the clutch pedal will be applied which reduces the contact between the gear tooth so whenever the clutch is applied the contact is removed and then the gear will moved and the desired gear will be applied, and also whenever the speed is reduced by means of applying the brake pedal gear is also reduced. This will be very much more useful for physically challenged people than the mechanism like twist, push pull mechanism and also than the google cars. So people can easily drive the manual car very comfortably.

5.1 PERFORMANCE ANALYSIS

A performance analysis of Joystick controlled manual transmission vehicle offers advantages such as greater control and ease of use. Vehicles with manual transmissions operated by joysticks may perform better because gear changes are more accurate and precise. The gearshift required by conventional manual gearbox automobiles might be challenging for certain people to use, especially those with impairments or restricted mobility. A simpler, more user-friendly interface for managing the gearbox may be offered through joystick control, which might result in more seamless gear changes and better driving performance. More accurate and user-friendly control over the vehicle's speed and acceleration could be possible with joystick-controlled clutch, brake, and accelerator. With the joystick

instead of the standard pedals, the driver could regulate the throttle position and apply the brake more smoothly and precisely, which might increase driving performance and lessen driver fatigue. In addition, people with impairments or restricted mobility who would have trouble using conventional pedals could find joystick control useful. The accelerator, brake, and clutch could all be used more easily and comfortably if the joystick were positioned in a more convenient area. Additionally, using a joystick instead of a physical gearshift may enable faster gear changes since the driver may quickly move the joystick to the required gear. This may be especially useful when travelling at high speeds and changing gears quickly and precisely is required. Overall the performance of joystick controlled Vehicle will be much better than normal vehicle and also better than other mechanisms, Because the clutch and the gear changing mechanism are absent in automatic transmission cars, the presence of push-pull and twist-pull mechanisms makes it more difficult to operate various mechanisms, including those for changing gears, accelerating, braking, and engaging clutch, and controlling the steering wheel with two hands. However, manual transmission cars will find it more challenging to operate at a given point Therefore, the task has been streamlined to prevent all of that.

5.1.1 Theory of Actuating System

While designing the pedals for hand operation different systems were taken into the account . So These systems are may be roughly categorised based on the mechanism they use to activate the pedals. Actuating systems are crucial elements in a variety of applications, including robotics, automation, and aerospace systems. They are used to transform different types of energy into mechanical motion or force. comprehending the fundamentals of energy conversion and the methods by which motion or force is produced is necessary for comprehending the theory of actuating systems. Actuating systems can generate motion or force using a range of energy sources, such as electrical, hydraulic, pneumatic, or thermal energy, and a number of actuator types, including motors, pumps, and valves. Understanding these energy sources' and actuators' characteristics and behaviours, as well as the dynamics of the mechanical systems they are employed to regulate, is part of the theory of actuating systems. In electronic systems, a microcontroller that is often connected to a motor controls

every control electronically. This motor may be a basic motor or a servo motor. The benefit of a servo motor is that it continuously feeds back to the system and modifies its inputs as necessary. However, the price is greater. Hydraulic The first kind of methods for actuating machines are mechanical ones. Linkages, gears, levers, cams, etc. are used in mechanical systems. Once these systems are created, they are difficult to alter or adapt. Additionally, compared to other systems, they take up a lot of space. Similar to hydraulic systems, pneumatic systems operate by using compressed air rather than a liquid. It would be necessary to continuously check the air pressure, which would need more instruments and cost more money. Additionally, they would require a huge space for the air storage tanks, much like a hydraulic system.

5.1.2 Theory of Hand Grippers

The hand capabilities of persons with disabilities serve as the sole foundation for the complete driving assistance system. Under acceleration and braking, the hand should maintain a firm grasp on the levers. To create grips that are cozy, useful, and secure to use, the philosophy of hand grips for individuals with disabilities entails a study of biomechanics and ergonomics. The grips must be made with a variety of hand sizes and shapes in mind, as well as the user's particular requirements and restrictions. The maximal force produced by the simultaneous contraction of the extrinsic and intrinsic hand muscles, which flex the hand joints, is represented by the strength of the hand grasp. The utmost voluntary force that an individual is capable of applying under typical bio-kinematic circumstances results in the power grip. This powerful flexion of all finger joints creates the power grip. Also in that power grip, the entire hand is used to grasp the target. As a consequence, the object's whole surface area is comprehended. During breaks or while the car is in park, hand grippers can be used. While on a lengthy drive or during your commute, you may practise your grip strength in this practical approach. Before utilising hand grippers, it's crucial to confirm that the car is securely parked and not moving. A spring or other resistance mechanism joins two handles to form a hand gripper in most cases. To build up the muscles in the hand and forearm, the user squeezes the handles together while struggling against the spring's resistance. As a result, this grip is employed in applications where larger

pressures are needed since it offers the maximum force of all the grips. We employ a power grip since the dominant hand exerts more force while operating our mechanism—roughly 62 kg. As a result, this force is sufficient for using the mechanism.



Fig: 5.1: Hand Grippers

CHAPTER 6

SUMMARY AND CONCLUSION

6.1 SUMMARY

The Joystick controlled mechanism technology for controlling the acceleration, brake and clutch will be very much useful and also reduces the most of the effort for physically challenged people to drive the vehicle very much comfortable, which comparing to the twist and pull mechanism or push and pull mechanism or any other mechanism, while it also some disadvantages also like its sensitivity, but its very much accurate and precise, and also can be easily replaceable if any damages occur and also will be portable so it can be easily switch while using it. And also We all know that there will be no limits in any kind of work (or) project which can even keep on improving in the future. There will always be a scope which will present in the future also for our present work. In our project design and fabrication of automatic transmission for physically challenged people further modification can be made also which are Joystick can be made like a screen which has a joystick that can be changed by making contact with the joystick in the display screen and also Gear shifting can also be done by using RPM.

6.2 CONCLUSION

A condition or function that is thought to have significantly contributed to a person's difference from the group constitutes a disability. Social rights and citizenship for people with disabilities are currently hot topics of discussion. In affluent nations, the discussion has progressed beyond a worry about the alleged expense of keeping the dependents and is now focused on finding practical means of ensuring that individuals participate in all aspects of daily life. The Automatic transmission for physically challenged people has been designed in an efficient and very much easier way to control acceleration, braking and also changing the required gears by applying the clutch. This system has also been tested and checked whether it is working properly or not. From that we had concluded that the model is capable of performing with respect to its design specification and almost this system reduces most of the work effort for physically challenged people for applying clutch, brake, and acceleration and made it as more easier for controlling

in joystick The existence of push and pull mechanism, twist and pull mechanism requires more work to operate and for engaging different mechanism like changing gears, acceleration, brake and engaging clutch and to control the steering wheel is much difficult to control with two hands, which can be useful for automatic transmission cars because of clutch and gear changing are not present but when it comes to manual transmission cars it will be very difficult to operate at a certain period of time which may even sometimes leads to accident also. So to avoid all this, the work has been simplified.

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