

ALIVE HUMAN DETECTING ROBOT SYSTEM FOR EARTHQUAKE RESCUE OPERATION

Submitted in partial fulfillment of the requirements for the Award of Bachelor of
Engineering Degree in

Electronics and Communication Engineering

By

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KOLAPALLI SAI MAHESH (39130231)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600119

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BONAFIDE CERTIFICATE

his is to certify that this Project is the bonafide work of **KONDAPALLI BABA RAJA
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project entitled "**Alive Human Detecting Robot System for Earthquake Rescue
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DECLARATION

KONDAPALLI BABA RAJA NAIDU (39130704) and KOLAPALLI SAI MAHESH (39130231) hereby Declare that the Project Report entitled "Alive Human Detecting Robot System For Earthquake Rescue Operation" done by us under the guidance of Dr G.D. ANBARASI JEBASELVI M.E, Ph.D., at Sathyabama Institute of Science and Technology, Chennai-600119 is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

DATE: 20/4/23

PLACE: Chennai

SIGNATURE OF CANDIDATE'S

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ABSTRACT

Tremors have a startling effect, and separating humans from other living organisms is extremely difficult. As a result, persons are frequently buried beneath the debris, making identification difficult. Individuals who are covered with bricks and injured can be saved by a timely salvage. This idea offers a human-searching equipment in the shape of a robot car that may be used as a fallback plan to rescue lives in the event of a catastrophe. In general, the sensor picks up human body thermal pictures. Accurate and consistent human recognition and monitoring is a significant challenge in the study of intelligent robot devices.

A search approach is provided to address the existing shortcomings. In an experimental setting, the rate and precision of human detection using the suggested method were evaluated. It is suggested that commands to move left, right, forward, or backward be used to control the robot's direction of travel. Additionally, we planned to equip the robot with sensors that would enable us to keep an eye out for and locate people among the debris. A moving chase all-course robot that can manoeuvre in tremor-prone environments is equipped with the Grid eye sensor. The robot is powered by a dc motor for improved strength and low speed and a stepper motor for enhanced rotation accuracy, allowing for accurate position control. To accomplish forward and backward movement, the robot has a three-wheel drive with DC motors and Bluetooth linked.

Keywords: Grid eye sensor, Arduino UNO, Motor driver, Bluetooth module, DC motor.

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LIST OF ABBREVIATIONS

CBRNE	Chemical, Biological, Radio Logical, Nuclear or Explosive event
USAR	Urban Search and Rescue robots
PIR	Passive Infra-red
RPA	Robotic Process Automation

CHAPTER 1

INTRODUCTION

Robotics is the creation and employment of machines (robots) to carry out jobs that are generally and typically performed by humans. Robots are frequently employed in a variety of industries, including the manufacturing, automotive, medical, and construction sectors, to carry out simple, repetitive operations as well as those that must be completed in potentially hazardous human conditions.

Robotics is a subfield of design that includes the creation, manufacture, and various uses of robots. Producing intelligent machines that can assist people in a number of ways is the industry's main objective. Robotics can take on a variety of forms. Robots can be designed to look like people, or they can be mechanical programmes like automated process computerization (RPA), which imitates how people use programming to carry out routine, rule-based tasks.

The concept is undoubtedly not novel, even in the field of robotics, where research into the potential applications and usefulness of robots has expanded significantly in the 20th century. Rescue robots are specifically developed to aid in the search and rescue of people who have been injured in a disaster. Rescue is about to surge in popularity for two main reasons. First, the emergency response team will now be more aware of the hazards of injuries in crisis circumstances than in the past. Second, to limit the risk of injury, rescue robots will be employed more frequently to gather real-time data on the situation and respond appropriately.

The operation, design, manufacture, and use of robots are all part of the science and engineering discipline known as robotics. Robots are machines that can be programmed to perform a variety of activities autonomously, usually with considerable autonomy. Robotics encompasses a range of sub fields, Artificial intelligence, Electrical engineering, Computer science and also mechanical engineering. Robots are used in wide range of applications, from manufacturing and logistics to healthcare and entertainment. They are particularly useful in environments that are dangerous, inaccessible, or repetitive for humans. For example, Robots are utilized in many applications, from assembling and strategies to medical care and diversion.

The design and construction of robots typically involves various components, including sensors, actuators, micro controllers, and software. Sensors allow robots to perceive their environment, while actuators enable them to move and manipulate objects. Microcontrollers provide the brain of the robot, allowing it to process data and make decisions. Software is used to program the robot to perform various tasks autonomously.

In addition to these techniques, there are also specialized sensors that can be used to detect the presence of living humans. For example, some sensors can detect the presence of carbon dioxide, which is produced by humans as they breathe. These sensors can be used to detect the presence of living humans in confined spaces or areas that are otherwise difficult to search. Ultimately, the key to successful human detection during an earthquake is a combination of trained personnel, specialized equipment, and an organized search and rescue effort. By working together and utilizing all available resources, search and rescue teams can increase the chances of locating and rescuing survivors in the aftermath of an earthquake.

Secondly, in this situation climate change is increasing the frequency and severity of disaster events which are sudden and natural, such as floods and wildfires. To keep up with the demand for rescues in this situation, robots will play a very important role. In the upcoming years, these technologies will take the place of people and human activities. Although these robots can be employed for any task, they are currently being deployed in delicate situations such as bomb detection and deactivation. Robots can take on any shape, but many of them now resemble humans. The robots that have adopted a human look are expected to walk, speak, think, and, most importantly, do everything else that humans are capable of. Most today's robots, also referred to as "bio-inspired robots," draw their inspiration from nature.

The design, manufacture, use, and application of robots are all included in the interdisciplinary field of robotics. It combines knowledge and techniques from various fields, including computer science, engineering, physics, mathematics, and biology. Robotics has become an increasingly important area of research and development due to its potential to revolutionize a wide range of industries and applications. Here, we'll examine the development of robotics, its components, the numerous types of robots, and its uses across a range of industries.

1.1 THE HISTORY OF ROBOTICS

The origins of robotics can be found in antiquity, with the first recorded evidence of automation dating back to ancient Greece. The mathematician Archytas of Tarentum is credited with designing a wooden pigeon that could fly using steam power. However, Robotics wasn't developed into a recognized academic topic of study until the 20th century became a formal field of study. In 1954, George Devol and Joseph Engel Berger developed the first real robot Known as Unimate, it was employed to carry out repetitious activities. in a General Motors factory. The Unimate was the first industrial robot and marked the beginning of the robotics industry.

Since then, robotics has made significant progress, with advances in technology leading to the development of more complex and sophisticated robots. The introduction of microprocessors and sensors in the 1970s and 1980s enabled the creation of robots that could be programmed to perform a wider range of tasks. In the 21st century, advancements in artificial intelligence and machine learning have increased the intelligence and adaptability of robots.

1.2 COMPONENTS OF A ROBOT

- The mechanical structure, the power supply, and the control system are the three basic parts of a robot.
- The mechanical structure of a robot is its physical body. It includes the robot's joints, actuators, and sensors. The joints allow the robot to move, while the actuators provide the force needed for movement. The sensors allow the robot to detect its environment and interact with it.
- The power source of a robot is the energy that drives its movement. It can be electrical, hydraulic, or pneumatic, depending on the type of robot and its application.
- The control system of a robot is its brain. It consists of the software and hardware that enable the robot to perform its tasks. The software controls the robot's movements and processes the data collected by its sensors. The hardware includes the microprocessors, sensors, and actuators that are used to control the robot's movement.

1.3 TYPES OF ROBOTS

Robots come in a variety of forms, each created for a specific application. The most common types of robots include:

- Industrial Robots - Robots that are utilized in manufacturing facilities and factories to carry out repetitive operations like product assembly, welding, and painting are known as industrial robots.
- Service Robots - These are robots used in a variety of settings, such as hospitals, hotels, and airports. They are made to carry out jobs that are too risky, challenging, or time-consuming for people to complete.
- Mobile Robots - Robots that can move around and interact with their surroundings are referred to as mobile robots.
- Humanoid Robots - These are robots that are designed to resemble humans in appearance and behavior. They are often used in research and development and for educational purposes.

1.4 APPLICATIONS OF ROBOTICS

- Robotics is used in a variety of sectors, including industry, healthcare, agriculture, transportation, and space exploration.
- In the manufacturing industry, robots are used industry to carry out repetitive jobs including assembly, welding, and painting. They can complete tasks quicker and more effectively than people, which increases production and lowers Labouré costs.
- Robots are utilized in the healthcare industry to aid with operations and carry out other medical treatments. They can also be used to support the elderly and the disabled and aid in rehabilitation.

Robots are an advanced form of machinery that are utilized to do complex jobs and have the ability to independently reach conclusions. When designing a robot, it's important to keep in mind the task at hand as well as the limitations of the machine. Each basic level of complexity in a robot has a scope that limits the tasks that can be carried out. Basic robots' complexity is typically determined by the number of limbs, actuators, and sensors they employ, whereas advanced robots' complexity is typically determined by the number of microprocessors and microcontrollers they employ.

The Alive Human Detection Robot using Grid-EYE Sensor controlled by Bluetooth is a project designed to detect presence of human in a disaster-stricken area such as an earthquake. The robot uses a Grid-EYE sensor, a small infrared thermal sensor array that can detect changes in temperature, to identify the presence of humans in the area. The robot is controlled by wirelessly via Bluetooth by a mobile device such as a smartphone or tablet. The extent of the robot is increased when a component is introduced, and the level of the robot is raised whenever a joint is added. The conception, design, use, and construction of robots are all topics covered in the branch of engineering known as robotics.

Different types of robots can complete different kinds of tasks. For instance, a large proportion of robots are designed for gathering labour, meaning they are not appropriate for other tasks. These robots are referred to as gathering robots.

Essentially, Numerous suppliers supply welding materials to robots for crease welding, and these robots are referred to as welding robots. While then again numerous robots are intended for uncompromising and are famed for their Rock-solid Robots. There are a few applications beneath:

- Agriculture robots.
- Family robots.
- Homegrown robots.
- Nano robots.
- A robo can likewise do Grouping task.
- Robots has progressively been involved in more than people in assembling while
- The majority of the works in the automotive industry are "Robots".
- A significant portion of robots are used as military robots.
- The usage of robots to clean up areas with dangerous materials or modern garbage.
- Swarm robots.

The promise of robots is that they will be able to move and manipulate materials with the

same panache and ease as a computer programme can with data.

Police Robots are perfect for situations that are hazardous or difficult for first responders to access since they can modify objects and acquire data using a variety of technologies. It consists of robots with different data and communication capabilities that are suitable for a range of circumstances. Fig 1.1 and 1.2 attached below are some examples of robots used in various industries.



Fig 1.1 Robot used for police Investigation

Robots now dig minerals, put semi-processed materials together to make automobile parts, and put those parts together to make cars.



Fig 1.2 Types of Robots

In outline, advanced mechanics is the field connected with science and innovation essentially connected with advanced mechanics. It has a strong foundation thanks to the accomplishments of many different academic disciplines.

[illegible]

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CHAPTER 2

LITERATURE SURVEY

Looking through the more than 30 years of robotics literature, UASR has consistently been mentioned as a useful application of robotics.

On July 11, 2013, the Atlas disaster-response robot had its public premiere. The 6'2" 330-lb. humanoid robot that Waltham, Massachusetts-based Boston Dynamics created for DARPA originally weighed 330 pounds.

The goal of the last 45 years of robotics research has been to address the technological requirements of applied robotics. The demands of humans have surpassed this advancement. Modern robots were introduced to the factory in the middle of the 1960s as a result of the contemporary upheaval, freeing the human administrator from risky and damaging tasks. Modern robots currently need more adaptability and expertise due to the later integration of these machines into many types of creating processes. Field and administrative robots are currently needed to handle the new market and to human social requirements due to the creation of new markets and necessities outside of the traditional assembling automated market (such as cleaning, demining, development, shipbuilding, horticulture), as well as the changing environment we live in.

"Deep Reinforcement Learning for Robotics: A Survey" by Yan Duan, John Schulman, et al. This paper provides a comprehensive survey of the application of deep reinforcement learning techniques in robotics. It covers topics such as robot control, perception, and manipulation, and discusses the challenges and opportunities in this area. Since they have been in use for so long, rescue robots' technology has advanced significantly, and this includes their mechanical dependability when deployed in the field. Due to the wide range and complexity of disasters experienced not only in Japan but around the world, robot technology is seen as a next-generation industry that can promote employment and economic development and help advance the 2030 Agenda for Sustainable Development through workable solutions.

Robots may search avalanche sites, go inside burning buildings, or guard against dangerous substances contaminating city streets, saving lives and enhancing the effectiveness of rescue operations. Rescue robots have been used for a long time, and they have undergone significant innovation over time, including improvements.

Innovation is essential in robot technology, which is regarded as a next-generation industry that can promote employment and economic development and help advance the 2030 Agenda for Sustainable Development through use-case-based solutions, due to the variety and complexity of disasters experienced not just in Japan but around the world.

Robots could scour torrential slide locales, enter consuming structures or secure city roads debased by harmful synthetic substances, saving lives and expanding the adequacy of salvage missions. They can aid in search and rescue efforts, risk analysis, and the handling of insurance claims during a chemical, biological, radiological, nuclear, or explosive catastrophe. This innovation might in fact be utilized to help recognize and smother fierce blazes and tall structure fire reaction

The proposed an organization framework and a calculation for a salvage robot to get its situation under fell region utilized omni directional sensor which has specific area of inclusion for detailing the noticing amount and brief tag. As a result of this the framework was build transitory correspondence. The planned robot to work in outside condition. Due to the limitations of wireless connectivity and the complexity of the rescue effort, the robot was designed to operate in outdoor environments such as disaster areas. Since the full operation of the robot could not be continuously supervised by a human operator, autonomous robot was used.

Innovation is developing step by step to make life simple and agreeable. In light of mechanical turn of events, data about various catastrophic event can foresee prior. Be that as it may, man can't keep catastrophic event from occurring. Now and again they, when all is said and done, get catastrophe to others the state of war or bombarding or transportation mishap or significant fire and so forth. Presently a day, because people are destroying slopes, cutting down trees, and allowing urbanization to occur naturally, catastrophic events like floods, tremors, and tornadoes continue to occur frequently. Many people lose their lives and property in disasters. Due to their dense population and poor-quality infrastructure, non-industrial countries like Bangladesh are in a much worse situation. The first 48 hours following a disaster are crucial for protecting deserters. Policemen, fire administration are sent to reduce the number of fatalities and damage, paramedics are being sent.

Once in a while the salvage group can't arrive at many pieces of catastrophe impacted region because of the powerlessness to look for the live individual in the garbage. In some circumstance, they, when all is said and done, turned into the casualty

of the circumstance. To lessen misfortunes of lives and for getting exact data of the circumstance, a mechanical framework can be utilized and can be changed by the requirements of the circumstances.

In the area of mechanical technology, quality work has been completed to support salvage robot. Over the past ten years, numerous types of salvage robots have been developed for a variety of tasks and situations. "Autonomous Navigation in Cluttered and Dynamic Environments: A Review" by Feras Dayoub, et al. This paper provides a review of the state-of-the-art in autonomous navigation in cluttered and dynamic environments. It covers topics such as obstacle detection and avoidance, localization, mapping, and path planning. The first time salvage robots were actually used was during the September 11 disasters. They were sent into the debris to look for remains and survivors. However, from about 2010, there have been an increasing number of instances where robots have been used quickly, with 2011 marking a crucial year for their use in the Christchurch and Tohoku earthquakes.

A robot designed to support the most rescue work is called a rescue robot. There have been 35 disasters worldwide where robots have been used. In this industry, a variety of rescue robots are used. Some of them employ various kinds of cameras, such as warm and IR cameras or wide-point cameras for wide vision of the garbage, to find survivors. Others use sensors, such as ultrasonic sensors or PIR sensors, to distinguish between humans in poor condition. Additional sensors for detecting heat, fire, and bombs are located in one area of the robot.

In the proposed system, a microcontroller running the Arduino UNO operating system can handle programming languages like C, C++, etc., but C programming is utilized to control and communicate with a robot through USB.

CHAPTER 3

This chapter contains Aim of the project, problem statement, existing system, drawbacks of existing system, proposed system, and block diagram of proposed system

3.1 AIM OF THE PROJECT

The point of our work is to design a robot to identify human or living in a debris trapped solution and save the survivors in earthquake areas. It will be challenging to find victims immediately if they are stuck inside debris. Mobile robots are used in this case since they can enter the building, look for victims, and alert the team to help them. Tracking the victims in the disaster area is the goal of using mobile rescue robots. Disasters present the rescue crew with a number of challenges that make it difficult for them to reach the victims, including rainstorms, collapsed structures, barriers, and hazardous materials. The catastrophe region is covered by a mobile rescue robot to rescue people who are injured survivors, unconscious survivors, etc. The rescue team must quickly and securely locate information of the disaster locations.



Fig 3.1 Picture of Conventional Rescue system

An opportune salvage can save individuals who are covered and injured. Figure 1 shows customary salvage framework, to recognize live or harmed people as fast as conceivable to offer essential support and save its life. In such circumstances, salvage framework should accept quick choices under tension, and attempt to get casualties to safe area notwithstanding copious advice to the contrary. The salvage framework should gather the area data and status of casualties, dependability of the designs as fast as

conceivable so doctors and firemen can enter the war zone and save individuals. This large number of works are performed for the most part in extremely perilous and dangerous circumstances by human and prepared canines.

Location by salvage laborers becomes tedious and because of the tremendous region, that gets impacted it turns out to be more troublesome. In this way, flexible robots have been suggested for some time to assist them and carry out tasks that neither humans, dogs, nor existing machinery are capable of. As a result, the project suggests a mobile salvage machine that may travel about the Debacles area and aid in finding alive people and salvage activities

3.2 PROBLEM STATEMENT

In starting days canines were utilized due to their high aversion to any slight movement or human presence. In any case, it was difficult to thoroughly rely upon them since they can foresee the presence of a living casualty and dead casualty and, they couldn't uncover what is going on of the human. One significant downside was canines couldn't work freely; they need help of a human. That is to say, the need is absolutely or to some extent autonomous to human element yet at the same time relies upon human.

3.3 EXISTING SYSTEM

The alive detection robots during earthquake uses PIR sensor PIR sensor only detects motion and it will compare the images before motion and after motion and if there is any change, they will send the notification.

3.4 DRAWBACKS OF EXISTING SYSTEM

The PIR sensors are having limitations like PIR sensors require a direct line-of-sight to detect human presence. This means that they may not be able to detect humans behind obstacles or in areas with poor visibility, they may not be suitable for use in harsh environments or extreme weather conditions' sensor is only for motion detection we cannot find the object or any indication if the object is not moving.

PIR sensors let you see if anything is moving. They are used to determine if a person has moved into or out of the range of the sensor. They are typically found in devices and machinery used at home or in workplaces. The terms "PIR", "Detached Infrared", "Pyroelectric", or "IR movement" are widely used to refer to them

3.5 PROPOSED SYSTEM

Natural disasters do happen, and they cannot be stopped. However, despite the fact that disasters cannot be prevented, humans are becoming more and more conscious of the concept of intelligent rescue operations in such situations. Even so, a lot of catastrophes still happen suddenly; an example of this is an earthquake. The goal of this project is to create a working robot with a Grid-EYE sensor that can recognise the presence of living people.

Earthquakes have a destructive impact and don't distinguish between human and inanimate objects. As a result, it's common for people to become lost among the debris, making it difficult to find them.

As a result, the idea suggests a Bluetooth-controlled robotic vehicle that travels through an earthquake-prone region and aids in finding people who are still alive and conducting rescue operations. If any object is detected, there will be a discrepancy in the observed values, suggesting the existence of a human body underneath. We will link the robot with sensors to follow humans and can be saved by the rescue team we are using GRID EYE Sensor because,

- High accuracy: Grid-EYE sensors can detect human presence with high accuracy, as they can detect the temperature distribution of objects and distinguish between humans and other objects.
- Wide range: Grid-EYE sensors can detect human presence over a wider range than PIR sensors, making them suitable for larger environments.
- Multi-point detection: Grid-EYE sensors can detect human presence at multiple points simultaneously, making them suitable for applications that require tracking of multiple people.
- Environmental adaptability: Grid-EYE sensors are not affected by changes in lighting conditions and can work in a wider range of environmental conditions than PIR sensors.

3.6 BLOCK DIAGRAM OF PROPOSED SYSTEM

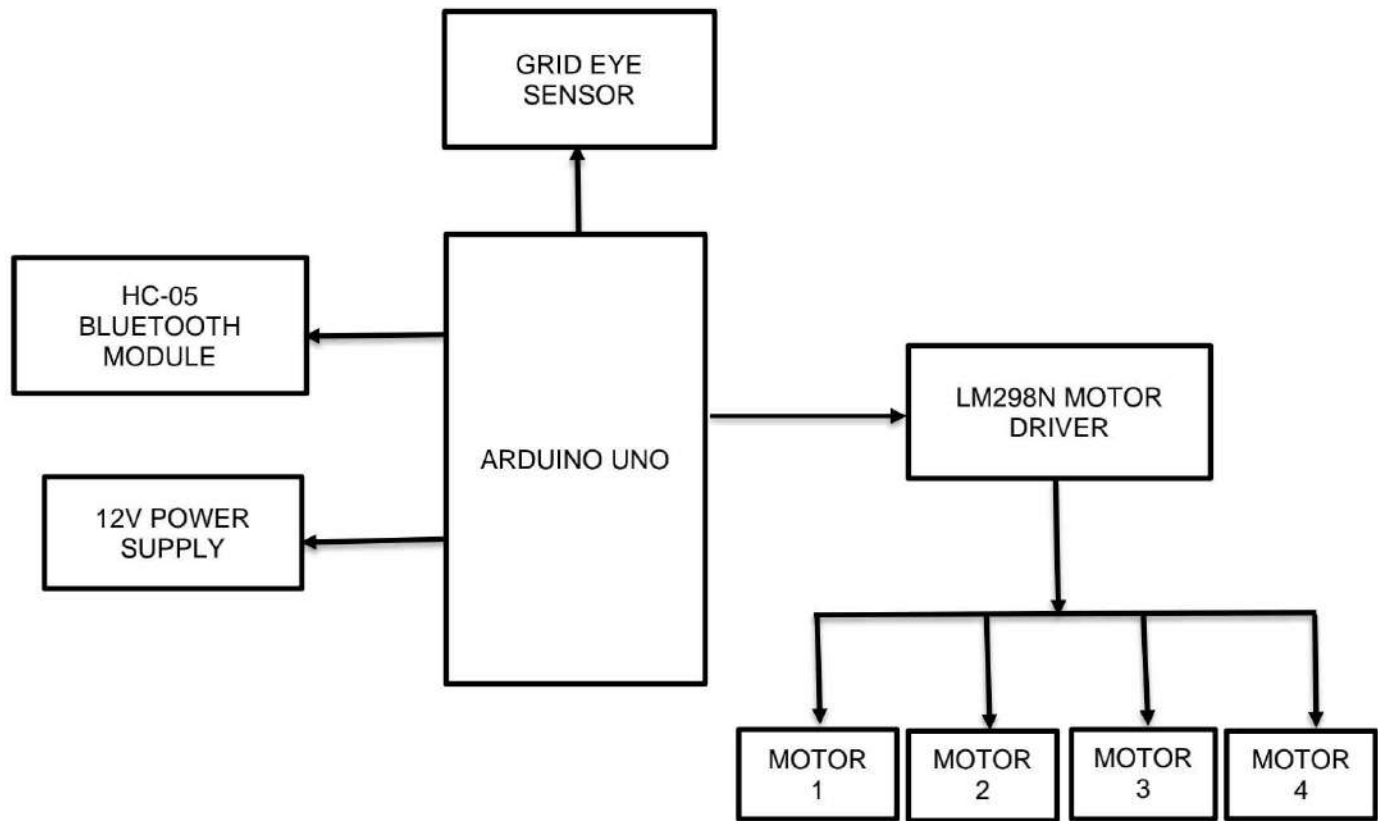


Fig 3.2 Block diagram of Proposed system

CHAPTER 4

HARDWARE COMPONENTS

- ARDUINO UNO
- GRID EYE SENSOR(AMG8833)
- HC-05 BLUETOOTH MODULE
- LM298N MOTOR DRIVER
- DC MOTORS
- JUMPER WIRES

4.1 ARDUINO UNO

A microcontroller board called Arduino Uno is based on the ATmega328P. It is the most popular Arduino board and is made for both beginners and experts. The board contains a 16 MHz quartz crystal, six analogue inputs, 14 digital input/output pins, a USB port, and a power jack. It is compatible with many sensors, shields, and other components, making it a versatile tool for projects.

An Arduino is actually a microcontroller-based device that can be used directly after purchase from a seller or can be assembled at home using the parts, as implied by its opensource equipment inclusion. It is mostly used for correspondences and for operating various devices.

- The Arduino project started in 2005 as a course for students at the Cooperation Configuration Establishment Ivrea in Ivrea, Italy, with the goal of providing a low-cost and straightforward method for beginners and experts to create devices that relate to their current situation using sensors and actuators. Examples of such devices often designed for amateur experts include simple robots, indoor regulators, and movement finders.
- The tavern in Ivrea, Italy, where some of the project's founders used to hang out is where the name Arduino originated. The bar bears the name of Arduino of Ivrea, who ruled Italy from 1002 to 1014 and served as margrave of the Walk of Ivrea.

A group of students at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy, launched the Arduino project in 2003. The goal was to create an easy-to-use platform for creating electronic projects and prototypes. The first Arduino board was called the

Arduino NG (New Generation), and it was based on the Atmel ATmega8 micro controller.

Over time, the Arduino project grew in popularity and became a global community of hobbyists, students, and professionals who use the boards for a variety of purposes, from controlling simple LED lights to building complex robots and automation systems.

The Arduino Uno was designed to be an upgrade to the earlier Arduino Duemilanove board. It features a more powerful micro controller, more input/output pins, and a USB interface for easier programming and communication with computers. The Uno has become one of the most popular Arduino boards, and it is widely used in educational and hobbyist projects, as well as in professional applications.

The Arduino Uno board's ATmega328P micro controller is in charge of managing the board's operations. It has 1KB of EEPROM, 2KB of SRAM, and 32KB of flash memory. Through a USB connection, the microcontroller talks with the computer and can be programmed with the Arduino Integrated Development Environment (IDE). Programmers can develop, build, and upload code to the board using the IDE's straightforward and user-friendly interface.

A microcontroller board called the Arduino Uno is based on the ATmega328P microcontroller. It is a popular development board used by hobbyists and professionals alike for prototyping and creating various electronic projects. The board is designed to be easy to use and program, making it accessible to those with little to no programming experience.

The Arduino Uno board includes a 16 MHz quartz crystal oscillator, six analogue inputs, 14 digital input/output pins, a USB port, a power jack, and an ICSP header. It can be powered by connecting it to a USB port on a computer or by using a DC power supply. The board also has a reset button that can be used to reset the micro controller.

The Arduino Uno board's ability to work with a variety of shields, which are add-on boards that can be used to increase the capabilities of The Arduino Integrated Development Environment (IDE), a free software programme that offers a user-friendly interface for creating and uploading code to the board, is used to programme the Arduino Uno board. The IDE has a basic C++-based programming language and offers several libraries and examples to assist users in learning how to programme.

From straightforward LED flashing projects to more complicated robotic and automation projects, the Arduino Uno board can execute a variety of programmes. A wide range of electronic components, including motors, sensors, and displays, can be managed by it.

The open-source nature of the Arduino Uno board is one of its benefits. Users can alter and personalise the board to fit their needs because both the board and its software are open-source. A sizable community of Arduino users and developers also exists, contributing to the platform's growth and offering assistance and direction to other users.

Overall, the Arduino Uno is a development board that is adaptable and accessible and is suitable for a variety of electronic projects. It is the perfect option for enthusiasts, students, and professionals alike due to its simplicity of use, compatibility with a broad variety of shields, and vast community of users and developers. Numerous uses are possible for the Arduino Uno board's digital input/output pins. They can be used to control outputs like LEDs, motors, or other devices or to read inputs from switches, sensors, or other devices. You can read analogue signals from sensors or other devices using the analogue inputs.

Either an external power source or the USB connection can be used to power the Arduino Uno board. The board contains an integrated voltage regulator that can produce a stable 5V output for powering other devices, and the power port accepts voltages between 7 and 12 volts.

The adaptability of the Arduino Uno board is one of its main benefits. From straightforward LED blinkers to intricate robotics projects, it can be used for a variety of tasks. Additionally, a variety of shields and components are available to increase its adaptability. The fig 4.1 shows Arduino UNO board with 14 digital input/output pins, a USB port, and a power jack.



Fig 4.1 Arduino UNO

4.2 GRID EYE SENSOR

The Grid-EYE Sensor and software jointly provide a thermal data image that shows the quantity and location of individuals based on their body temperatures. It also detects when the proper distance or density is maintained or not. With almost no contact, Grid-EYE, which is based on Panasonic's MEMS technology, can measure the temperature of the entire defined zone. An example of an infrared sensor is the Grid-EYE sensor that was developed by Panasonic Electric Works Corporation of America (now Panasonic Industrial Devices Sales Company of America) in 2013. The sensor is designed to detect and visualize heat signatures in a variety of applications.

The development of the Grid-EYE sensor was driven by the need for high-performance infrared sensors that could be used in a range of industries, including automotive, industrial automation, security, and building automation. The sensor features an 8x8 array of infrared sensing elements that can detect temperatures ranging from -20 to 100 degrees Celsius with a high degree of accuracy. It also has a fast response time and can detect changes in temperature within a fraction of a second.

One of the key features of the Grid-EYE sensor is its compact size and low power consumption. It measures just 11.6mm x 8mm x 4.3mm, making it suitable for use in small

devices and applications where space is limited. The low power consumption of the sensor also makes it ideal for battery-powered applications.

The Grid-EYE sensor is a thermopile array sensor developed by Panasonic. It is a 64-pixel infrared sensor that can detect heat signatures from objects and people within its field of view. The sensor operates on the principle of thermopile sensing, which involves measuring the temperature difference between two adjacent pixels to detect heat signatures. The Grid-EYE sensor is designed to be a compact, low-cost solution for applications such as occupancy detection, energy management, and thermal imaging. The sensor has a high accuracy and can detect heat signatures as small as 0.25°C. It also has a fast response time, with a measurement rate of up to 10 frames per second.

An infrared sensor called the Grid-EYE uses thermopile components organised in a 8x8 grid to detect heat radiation from objects. This sensor is manufactured by Panasonic and is commonly used in a wide range of applications, including robots, security systems, and building automation. The infrared radiation is measured using the Grid-EYE sensor emitted by objects in its field of view and converts it into an electrical signal. The sensor's 8x8 grid of thermopile elements allows it to detect the direction and intensity of the radiation, enabling it to determine the position and movement of objects in its field of view.

One of the key features of the Grid-EYE sensor is its high level of sensitivity. The sensor is able to detect temperature changes as small as 0.1°C, making it an ideal choice for applications where precision is critical. Additionally, the sensor has a wide operating range, with a temperature between -20°C and 100°C.

Another crucial aspect of the Grid-EYE sensor is its small size and low power consumption. The sensor measures just 11.6mm x 11.6mm x 4.3mm and consumes just 4.5mA of current at 3V, making it ideal for use in battery-powered devices. The Grid-EYE sensor communicates with a micro controller or other device using an I2C interface. This allows the sensor to be easily integrated into a wide range of systems and applications. The sensor can also be configured to operate in a number of different modes, including stand-alone mode, interrupt mode, and sleep mode.

One common use of the Grid-EYE sensor is in building automation systems. By placing sensors throughout a building, it is possible to monitor temperature changes and occupancy in real-time. In order to maximize both comfort and energy efficiency, this

information can subsequently be utilized to modify the lighting, heating and cooling systems, and other building systems.

In robotics applications, the Grid-EYE sensor can be used to detect the presence and movement of objects, allowing robots to navigate their environment and avoid obstacles. The sensor can also be used to detect changes in temperature, allowing robots to identify and respond to hot or cold objects.

The Grid-EYE sensor in security systems can be used to find burglars or other things in a secured environment. The sensor can also sense temperature fluctuations, which enables it to identify the existence of flames or other dangers. All things considered, the Grid- EYE sensor is a highly effective and adaptable infrared sensor that is suitable for a variety of applications. It is the perfect choice for battery-powered devices due to its high sensitivity, small size, and low power consumption. Additionally, due to its versatility in sensing temperature and position changes, it is an invaluable tool in a variety of sensing applications.

In conjunction with software, the Grid-EYE Sensor generates a thermal data image and recognizes the quantity and location of people based on their body temperatures. 64 pixels offer precise temperature monitoring over a silicon lens's 60° field of view. Fig 4.2 and 4.3 are attached below shows AMG8833 Grid eye sensor and, detection of people using grid eye sensor

APPLICATIONS

- People counting, multiple person detection
- Movement detection
- Thermal imaging
- Contact-less temperature measurement
- Detection without movement
- Position detection

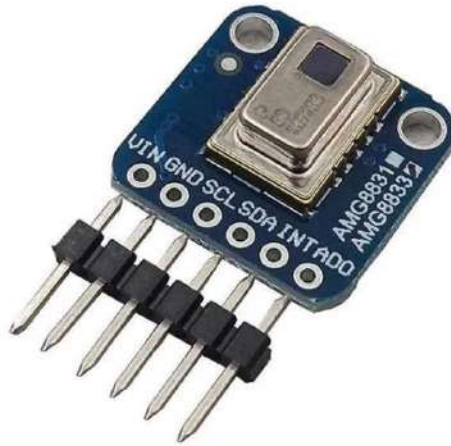


Fig 4.2 AMG8833 Grid Eye Sensor

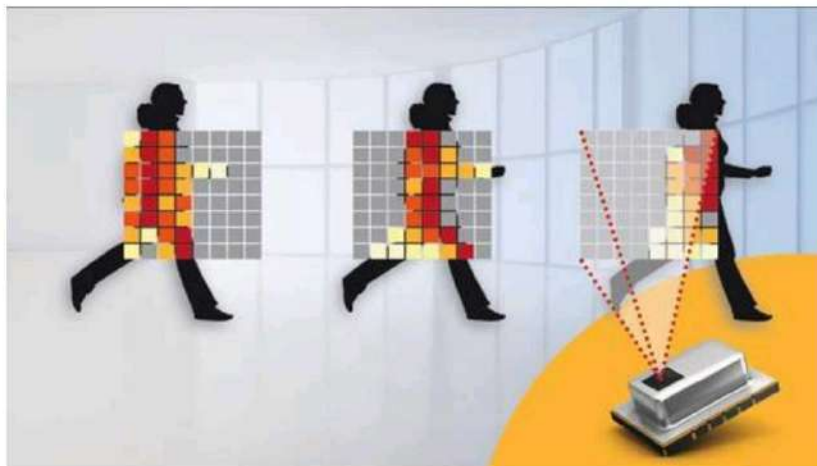


Fig 4.3 Detection of People using Grid Eye Sensor

4.3 POWER SUPPLY SYSTEM

The Micro controller can be powered by an external power source or by a USB connection. Board typically uses an external source of 6 to 20 volts to operate. It can be used to power a variety of electronic devices that require 12V input, such as LEDs, motors, and micro controllers. It typically operates on AC input voltage and converts it into a stable DC output voltage of 12V. However, the advised range is between 5 and 12 volts. The system could become unstable if the supply is less than volt. More than 12 V may cause the system to overheat and damage the board.

4.4 BLUETOOTH MODULE HC-05

A Bluetooth module called the HC-05 enables wireless device connectivity. It is a well-liked module since it is inexpensive, simple to use, and compatible with a variety of embedded systems and micro controllers. The HC-05 can be used to create a wireless link between two devices, such as a smartphone and a micro controller, or between two micro controllers.

The HC-05 is based on the Bluetooth 2.0 standard and supports the Serial Port Profile (SPP) protocol. This allows it to be used as a transparent serial communication link between devices. The module communicates with the host device using a simple serial interface, which makes it easy to integrate into a wide range of projects. Low power consumption is one of the main benefits of the HC-05 module. When the module is not in use, it features a sleep mode that may be activated to use less power. It is excellent for applications like wireless sensor networks and remote-control systems because of its range of up to 10 meters.

One of the key features of the HC-05 module is its ease of use. The module can be easily configured using a simple set of AT commands, allowing users to quickly set up and customize their Bluetooth communication settings. Additionally, the module has a built-in LED status indicator, making it easy to see when the module is in pairing mode or when a connection has been established.

The HC-05 module has a range of up to 10 meters, although this can be extended with the use of an external antenna. The module can operate in either master or slave mode, allowing for flexible communication between devices. In master mode, the module can connect to up to seven slave devices, while in slave mode, the module can only connect to one master device.

The HC-05 module is commonly used in a many of applications, which includes robotics, home automation, and remote-control systems. In robotics applications, the module can be used to wirelessly control a robot or to allow the robot to communicate with other devices. In home automation applications, the module can be used to control lights, appliances, and other home devices wirelessly. In remote control systems, Numerous devices can be wirelessly controlled using the module, including drones, cars, and boats.

One potential drawback of the HC-05 module is its limited data transfer rate. The module is capable of transmitting data at a maximum rate of 2.1 Mbps, which may be insufficient for certain high-speed applications. Additionally, the module is not compatible

with the Bluetooth 4.0 specification, which offers improved data transfer rates and energy efficiency. To use the HC-05 module, a user must first pair the module with the device they wish to communicate with. This is typically done using a pairing code, which is a simple password that must be entered on both devices to establish a secure Bluetooth connection. Once the devices are paired, data can be transmitted wirelessly between them using the SPP protocol. Overall, the A dependable and simple-to-use wireless communication module, the HC-05 Bluetooth module is ideal for a variety of applications. It is the perfect solution for a variety of wireless communication demands due to its low power consumption, simplicity of usage, and adaptability.

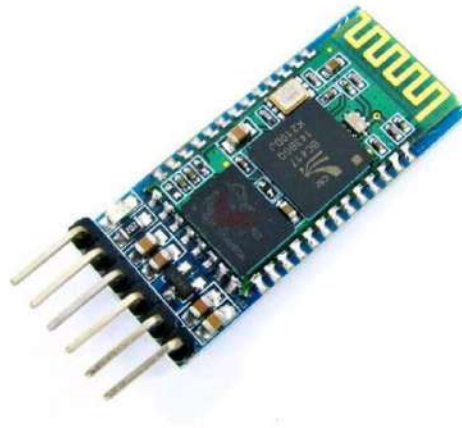


Fig 4.4 HC-05 Bluetooth module

Specification of HC-05 Bluetooth Module

- Version 2.0 of Bluetooth plus EDR (Enhanced Data Rate)
- ISM band at 2.4 GHz frequency
- GFSK (Gaussian Frequency Shift Keying) modulation
- Class 2 transmit power (up to 4 dBm)
- Sensitivity: -80 dBm typical
- Range: approximately 10 meters (or 33 feet) in open air
- Profiles supported: Serial Port Profile (SPP), Human Interface Device (HID), and other protocols
- 3.3V to 5V DC is the operating voltage.
- running current: less than 50mA
- Standby current: less than 2.5mA

- Sleep current: less than 1mA
- Interface: UART (Universal Asynchronous Receiver/Transmitter)

4.5 APPLICATION USED: SRITU HOBBY

A SriTu Hobby application controlling Bluetooth could refer to a mobile app that enables a user to control a Bluetooth-enabled device or system as part of their hobby. For example, let's say someone has a hobby of building and controlling robots. They might create a robot that can be controlled through Bluetooth technology, and then create a SriTu Hobby application that allows them to control the robot through their smartphone or tablet.

The SriTu Hobby application would likely include features such as the ability to connect to the robot via Bluetooth, control the robot's movements, and potentially even program the robot to perform specific tasks or respond to certain stimuli.

The application might also include features such as real-time data feedback, allowing the user to monitor the robot's performance and make adjustments as needed. Additionally, the app could include social features, such as the ability to share videos or images of the robot's movements with other hobbyists or enthusiasts. Overall, a SriTu Hobby application controlling Bluetooth has the potential to greatly enhance the user's hobby experience by providing a convenient and intuitive way to control their device or system.

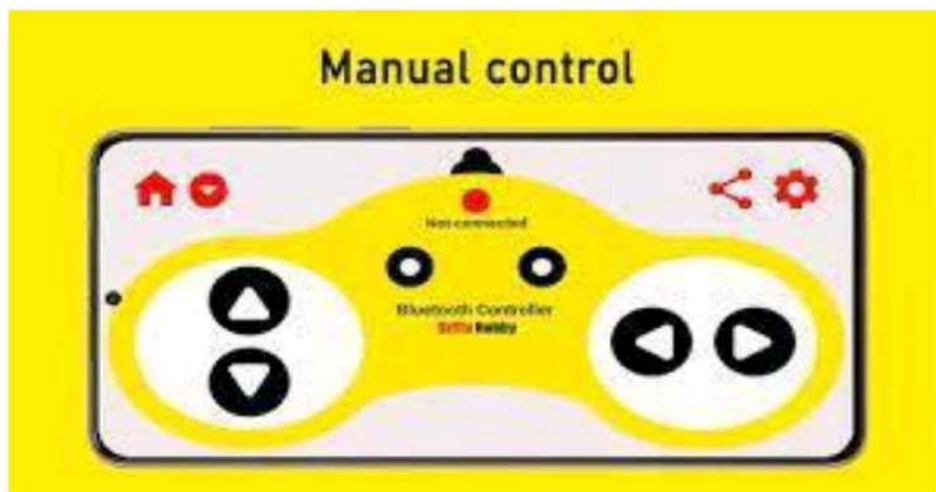


Fig 4.5 Application used for Bluetooth

4.6 LM298N MOTOR DRIVER

The LM298N is a Two DC motors or one bipolar stepper motor can be controlled using a dual H-bridge motor driver. The H-bridge circuitry allows the motor to be driven in both directions and at variable speeds. The LM298N is a popular motor driver IC because of its low cost, excellent efficiency, and ease of use. The LM298N motor driver is a dual H-bridge driver, which means it is capable of controlling the direction and speed of two DC motors or a single stepper motor. Each H-bridge consists of four transistors that are used to switch the current flow to the motor in either direction, allowing for precise control of the motor's speed and direction.

One of the key features of the LM298N motor driver is its high current handling capability. The driver is capable of driving up to 2A of continuous current per channel, making it suitable for use with a wide range of motors. Additionally, the LM298N motor driver is capable of handling peak currents of up to 3A per channel, making it suitable for use with high-performance motors that may require short bursts of high current. The LM298N motor driver also includes a number of protection features, including thermal shutdown and overcurrent protection. These features help to protect the motor driver and the connected motors from damage due to overloading or overheating.

The LM298N motor driver is typically controlled using a micro controller or other control device. The driver is suitable for a variety of micro controllers, and can be easily integrated into a variety of control systems. The driver is controlled using simple digital signals, making it easy to interface with a micro controller or other control device. One of the primary applications for the LM298N motor driver is in robotics. The driver is commonly used to control the motors in mobile robots, allowing for precise control of the robot's speed and direction. The driver is also commonly used in industrial automation and CNC (Computer Numerical Control) machines, where precise control of the motor is required.

The LM298N motor driver is also commonly used in hobbyist projects, such as remote- controlled cars and drones. In these applications, the driver is used to control the speed and direction of the motor, allowing for precise control of the vehicle. Overall, the LM298N motor driver is a flexible and dependable motor driver that works well in a variety of applications. As high as current handling capability, protection features, and ease of use make it an ideal choice for driving DC motors and stepper motors in a variety of

control systems.

The LM298N motor driver has four input pins that control the motor's direction and speed. Two input pins regulate the motor's direction, while the other two regulate its speed. The motor can be driven in either direction by setting the direction pins to high or low, and the motor's speed can be managed by applying a PWM signal to the speed pins. The LM298N motor driver also has built-in protection features that prevent damage to the motor and the driver IC. It has thermal shutdown protection, which shuts down the driver IC if it exceeds a certain temperature. It also has built-in protection against over-voltage and under-voltage conditions. The LM298N motor driver can be many different applications, including robotics, automation, and remote-control systems. It can be used with a variety of micro controllers and embedded systems, making it easy to integrate into a variety of projects.

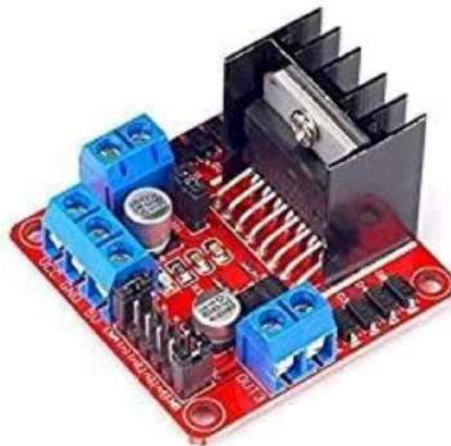


Fig 4.6 LM298n Motor Driver

4.7 DC MOTORS

A DC motor is an electrical machine that converts electrical energy into mechanical energy. When a DC motor is powered, a magnetic field is created in its stator. The field attracts and repels magnets on the rotor; this causes the rotor to rotate. To keep the rotor continually rotating, the commutator that is attached to brushes connected to the power

source supply current to the motors wire windings. DC motors are classified into two types: brushed and brushless. Brushed DC motors are the more traditional type of DC motor, and they use a system of brushes and commutators to switch the current direction in the motor's windings. Brushless DC motors, on the other hand, use electronic circuits to switch the current direction, eliminating the need for brushes and commutators.

DC motors are known for their ability to provide high torque at low speeds, making them ideal for applications where precise control of motor speed is required. They are also known for their reliability and durability, making them a popular choice for industrial applications where the motor may be subjected to harsh operating conditions. One of the primary advantages of DC motors is their ability to be easily controlled. The speed and torque of the motor may be accurately regulated by altering the voltage and current fed to it. This makes DC motors ideal for use in applications where precise control is required, such as robotics and automation. DC motors are also easy to install and maintain, which makes them a popular choice for a wide range of applications. They are relatively simple machines with few moving parts, which makes them reliable and easy to maintain.

One potential drawback of DC motors is their susceptibility to electrical interference. Because they operate using direct current, they can be affected by electrical noise and interference, which can cause the motor to malfunction. This can be mitigated by using shielded cables and other measures to reduce electrical noise and interference.

The commutator, which is attached to the power source's brushes, provides current to the engine's wire windings. Overall, DC motors are a reliable and versatile type of electric motor that are well-suited for a wide range of applications. Their ability to provide high torque at low speeds, ease of control, and reliability make them a popular choice for industrial, commercial, and hobbyist applications. Two DC motors are being used to propel the car. It gives robots the ability to travel from one location to another. The micro-controller is compatible with the DC motor utilised in this module. Fig 4.7 shows two dc motors.



Fig 4.7 DC Motors

- uses a rectifier to run on AC line voltage or DC power.
- Working rates of 1,000 to 5,000 rpm.
- 60-75% productivity rate.
- Strong starting force. Slow no-load speeds

Speed of the motor directly relates to back emf magnitude. Think about a dc motor whose load is abruptly lowered. When compared to the existing torque, the needed torque will be minimal. Due to the additional torque, the motor's speed will start to rise. As a result, the magnitude of the back emf will similarly grow as a function of speed. Armature current will start to decrease as back emf rises. Since torque is inversely proportional to armature current, it will also decrease until the load can be supported. Thus, the motor's speed will be controlled.

JUMPER WIRES

Jumper wires are electrical wires used to connect electronic components on a breadboard or a prototype circuit board. They come in various lengths and colors and have connectors on either end that allow for easy connection to electronic components. Jumper wires are commonly used in prototyping and experimenting with electronic circuits as they provide a convenient way to make and break connections without soldering. They are also commonly used in educational settings to teach electronics and circuitry.

4.8 SOFTWARE DESCRIPTION

The following software tools are used to connect hardware and software systems:

- Arduino IDE

4.9 ARDUINO IDE

The software programme known as the Arduino Integrated Development Environment (IDE) is used to upload and programme code to Arduino boards. The Arduino IDE is open-source and available for free download on the official Arduino website. It is designed to be user- friendly and accessible to beginners, while also providing advanced features for more experienced users. The Arduino IDE includes a code editor, compiler, and uploader all in one program. It supports a variant of the C++ programming language and comes with a range of libraries and examples to help users get started. The IDE also has a serial monitor that allows users to transfer data back and forth between their computer and the Arduino board.

The simplicity of the Arduino IDE is one of its standout qualities. The code editor has features like auto completion and syntax highlighting, and the UI is simple to use and also make programming easier. Additionally, the IDE has a large community of users who share their code and provide support through forums and other resources.

A piece of software called the Arduino Integrated Development Environment (IDE) makes it easier to create applications for the Arduino micro controller platform. The IDE provides a set of tools for writing, compiling, and uploading the Arduino board with code. Additionally, it has a serial monitor that enables developers to communicate with the board and debug their code. The IDE is available for Windows, mac OS, and Linux operating systems and is free to download from the Arduino website. It is based on the Processing IDE, which is a similar software application used for developing graphics and interactive applications.

The simplicity of the Arduino IDE is one of its key benefits. Even for people with little to no programming knowledge, it is made to be user-friendly and simple to use. The interface is intuitive and straightforward, with a menu bar at the top and a code editor at the center of the screen. The design is simple and intuitive, with a menu bar at the top and a code editor in the Centre of the screen. The code editor contains features like syntax highlighting. Coders may produce clear, error-free code with the help of the code editor's capabilities like syntax highlighting, auto-completion, and error highlighting.

The Arduino IDE is also highly customizable. Developers can choose from a range of board types and configurations, and the IDE will automatically adjust its settings

accordingly. Additionally, a large number of programming languages, including C and C++ are supported, which are the primary programming languages used for Arduino development.

One of the most powerful features of the Arduino IDE is its ability to interface with other software applications and devices. For example, developers can use the IDE to communicate with external sensors, actuators, and other hardware components, allowing them to create complex and sophisticated applications. It is simple to add additional libraries and functionality to the platform thanks to the library manager that is part of the IDE.

The Arduino IDE is open-source as well, allowing programmers to view and edit the original source code. Because of the high level of flexibility this offers, developers can adapt the IDE to their particular requirements. In addition to the standard IDE, the Arduino platform also includes a range of other tools and resources for developers. These include a hardware design editor, which allows developers to create custom Arduino boards, and a web-based IDE, which enables developers to work on their projects from any computer with an internet connection.

Overall, the Arduino IDE is a powerful and versatile tool that makes it easy for developers of all skill levels to create applications for the Arduino platform. Its simplicity, customizability, and wide range of features make it an essential tool for anyone interested in electronics and programming.

The Arduino IDE likewise permits clients to transfer code to an extensive variety of Arduino sheets, including the famous Arduino Uno and Arduino Nano. It also supports There are many sheets that are Arduino-viable and Arduino-determined. Some can be used in the opposite way and are almost identical to an Arduino. Many people enhance the fundamental Arduino by including yield drivers, typically for use in classroom instruction, to work on creating carriages and little robots. Others share the same electrical characteristics but alter the structural factor, occasionally showing similarities to protections and occasionally not. Several variants employ different processors, varying in resemblance. The informal Arduino and Arduino Little both use a detachable USB-to-chronic connector board or link, Bluetooth, or other methods. It uses the common AVR in-framework programming (ISP) microcontrollers, like the ESP32 and the ATmega328P. Generally, the Arduino IDE is a strong and open instrument for programming and transferring code to Arduino sheets. It's easy-to-understand interface and extensive

variety of elements settle on it a magnificent decision for fledglings and experienced clients the same.

In an extreme situation, the goal of this research is to provide a low-cost person recognition robot for salvage missions in non-industrial nations. The built robot is controlled by Bluetooth and will collaborate with the client to efficiently move the framework. To make the system reliable inside the conflict zone, the BLE module is used for information transfer. However, while having a variety of sensors and features, the Metropolitan Inquiry and Salvage (USAR) salvage robots are expensive. Human Recognition Robot is to give greater security to the clients to shield their possessions from burglars. By this framework, it will be an extraordinary assistance without a doubt to heroes in identification of the people at the fiasco locales. This is additionally easy to understand, practical, semi-independent, and proficient gadget for identification of people.

The sensors utilized in this undertaking are modest and effectively accessible and solid. The creators fostered a framework with level of human detecting to lessen power utilization and improve your skills in salvage work. The first is a Lattice eye sensor that can recognize people by their emitted infrared waves and transmit alerts to clouds using a micro controller to protect a group.

The two-level structure for human discovery provides a strong foundation for salvaging efforts.

4.10 Code Explanation for AMG8833

This code is for reading temperature values from an AMG8833 thermal camera using an Arduino board. It uses the Adafruit_AMG88xx library for communication with the camera.

In the setup() function, the code initializes the serial communication and checks if the AMG8833 sensor is connected properly. If the sensor is not detected, the code will print an error message and halt.

In the loop () function, the code reads temperature values from the sensor using the `amg.readPixels()` method and stores them in an array named `pixels`. Then, the code prints out each temperature value in the array using a for loop and a series of `Serial.print()` statements. The loop runs through the number of elements in the `pixels` array and prints the temperature value of each pixel in the sensor's grid. Afterward, the code delays for 500 milliseconds before repeating the process.

Overall, this code demonstrates how to use the AMG8833 thermal camera with an Arduino board to obtain temperature readings from a particular environment.

4.11 Code Explanation for Bluetooth HC-05

The code consists of two separate Arduino sketches. The first sketch uses the `Adafruit_AMG88xx` library to read temperature values from an AMG8833 sensor and print them to the serial monitor. The second sketch is designed to control a robot's movement via Bluetooth communication.

In the first sketch, the `setup ()` function initializes the serial communication and checks if the AMG8833 sensor is properly connected. If the sensor is not detected, the code will print an error message and halt.

The `loop ()` function reads temperature values from the sensor using the `amg.readPixels()` method and stores them in an array. Then, the code prints out each temperature value in the array using a for loop and a series of `Serial.print()` statements. Afterward, the code delays for 500 milliseconds before repeating the process.

In the second sketch, the `setup ()` function initializes the serial communication and sets up four output pins that control the robot's movement.

The `loop ()` function checks if there is any incoming serial data using `Serial.available()`. If data is available, it reads the value using `Serial.read()` and stores it in the `value` variable. Then, the code checks which command was received and calls the appropriate function to control the robot's movement. The commands are:

- 'D': move the robot forward 'U': move the robot backward
- 'S': stop the robot
- 'L': turn the robot left
- 'R': turn the robot right

Each of these commands corresponds to a function that sets the appropriate pins high or low to control the robot's motors. For example, the Forward () function sets the IN1 and IN3 pins high, and the IN2 and IN4 pins low, causing the robot to move forward. Overall, these sketches demonstrate how to read sensor data and control a robot's movement using the Arduino platform.

CHAPTER 5

RESULT AND DISCUSSION

5.1 RESULT AND ANALYSIS

The proposed work's outcome and analysis are provided below.

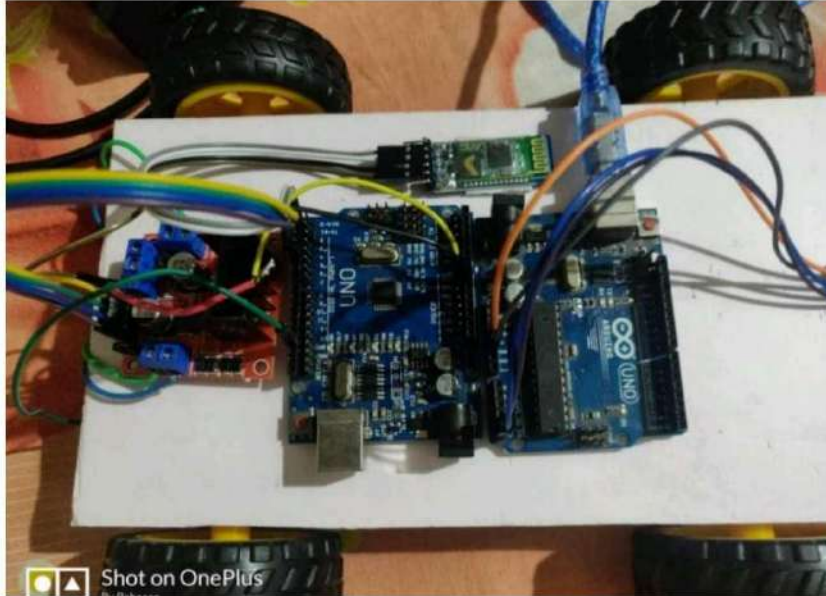


Fig 5.1 Connections and Circuit

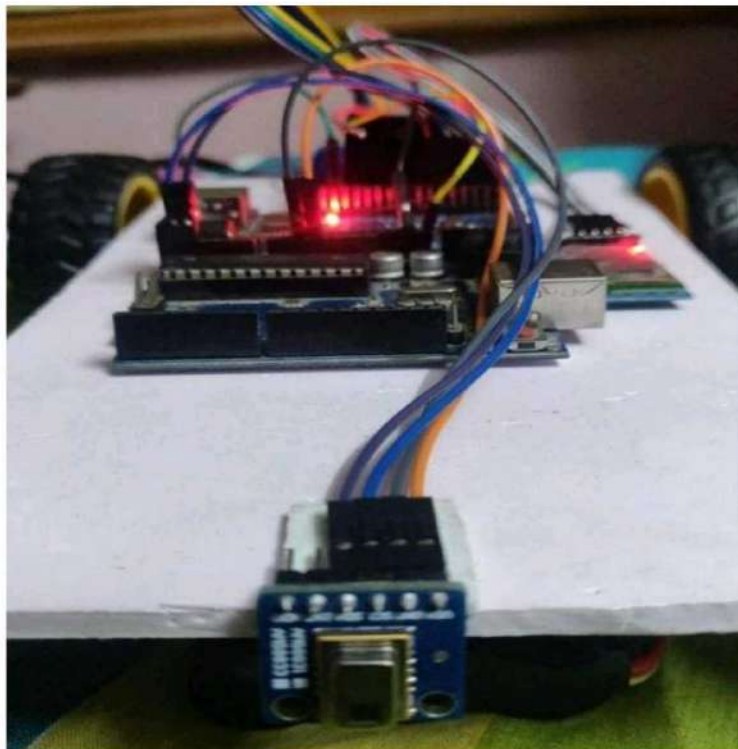


Fig 5.2 Grid Eye Sensor

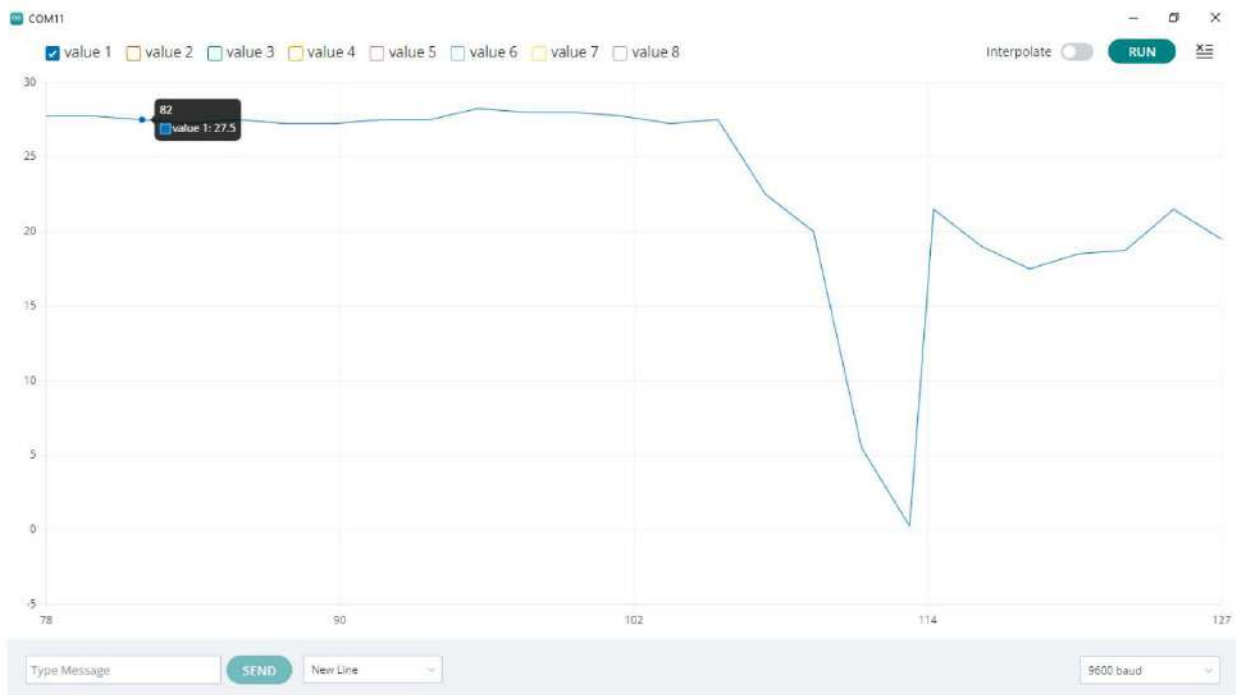


Fig 5.3 Serial Plotter output of GRID EYE SENSOR at ROOM TEMPERATURE (27 degrees)

```

sketch_mar27a | Arduino IDE 2.0.5-nightly-20230323
File Edit Sketch Tools Help

sketch_mar27a.ino sketch_mar27a.ino
1 #include <Wire.h>
2 #include <Adafruit_AMG88xx.h>
3
4 Adafruit_AMG88xx amg;
5
6 void setup() {
7   Serial.begin(9600);
8   while (!Serial) {
9     delay(10);
10  }
11
12  if (!amg.begin()) {
13    Serial.println("Could not find a valid AMG8833 sensor, check wiring!");
14    while (1);
15  }
16 }
17
18 void loop() {
19   float pixels[AMG88xx_PIXEL_ARRAY_SIZE];
20   amg.readPixels(pixels);
21 }

```

Output Serial Monitor x

Message (Enter to send message to 'Arduino Uno' on 'COM11')

28.50, 28.25, 28.75, 29.25, 29.75, 30.00, 29.50, 28.75, 28.25, 29.00, 29.50, 29.50, 29.25, 28.75, 28.50, 28.25, 28.50, 29.00, 29.25, 29.00, 28.50, 29.00, 28.00,
Temperature readings:
28.75, 29.00, 29.00, 29.50, 30.00, 30.25, 29.25, 28.00, 29.00, 29.00, 29.25, 29.25, 29.50, 29.50, 28.75, 28.75, 28.25, 29.00, 28.75, 29.00, 29.00, 28.75, 29.00, 28.25,
Temperature readings:
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36.50, 39.25, 37.25, 37.50, 37.75, 38.25, 38.25, 39.25, 38.25, 38.50, 37.25, 37.50, 38.00, 38.00, 37.50, 39.00, 39.25, 38.00, 37.50, 38.00, 38.25, 37.75, 37.25, 39.00,
Temperature readings:
36.00, 39.75, 37.75, 37.50, 38.25, 37.75, 38.25, 39.00, 37.50, 38.75, 37.50, 37.50, 37.50, 37.50, 37.50, 39.25, 38.50, 38.25, 37.00, 37.25, 37.50, 37.75, 37.75, 39.25,

Ln 20, Col 2 Arduino Uno on COM11

Fig 5.4 Serial Monitor output of GRID EYE SENSOR placed before HOT WATER (39-40 degrees)



Fig 5.5 Serial Plotter output of GRID EYE SENSOR placed before HOT WATER (39-40 degrees) in graph

```

sketch_mar27a | Arduino IDE 2.0.5-nightly-20230323
File Edit Sketch Tools Help

sketch_mar27a.ino sketch_mar27a.ino
1 #include <Wire.h>
2 #include <Adafruit_AMG88xx.h>
3
4 Adafruit_AMG88xx amg;
5
6 void setup() {
7   Serial.begin(9600);
8   while (!Serial) {
9     delay(10);
10  }
11
12  if (!amg.begin()) {
13    Serial.println("Could not find a valid AMG8833 sensor, check wiring!");
14    while (1);
15  }
16 }
17
18 void loop() {
19   float pixels[AMG88xx_PIXEL_ARRAY_SIZE];
20   amg.readPixels(pixels);
21 }

```

Output Serial Monitor x

Message (Enter to send message to 'Arduino Uno' on 'COM11')

27.75, 28.25, 28.25, 27.25, 27.50, 27.50, 27.75, 27.75, 28.75, 28.00, 28.00, 28.00, 27.75, 28.25, 27.75, 29.25, 28.00, 28.50, 27.75, 28.25, 28.00, 28.00, 28.75, 28.75, 27.75, 28.25, 28.00, 27.25, 27.25, 26.75, 27.50, 27.00, 28.50, 28.00, 28.25, 27.50, 27.00, 27.00, 27.50, 28.25, 28.25, 28.25, 28.50, 28.00, 28.00, 27.75, 28.75, 28.00

Temperature readings:

17.50, 4.00, -0.25, -1.50, -3.50, -3.75, -3.00, -2.75, 14.25, 3.25, -0.75, -2.75, -3.75, -4.25, -3.50, -2.50, 4.00, -0.50, -2.25, -3.25, -3.25, -4.75, -4.00, -3.75, 0

Temperature readings:

19.50, 0.50, -1.75, -3.50, -4.75, -5.00, -3.75, -2.75, 5.75, -0.50, -3.00, -4.75, -6.25, -5.75, -4.75, -3.25, -0.75, -2.50, -4.75, -5.25, -5.25, -6.25, -5.00, -4.25,

Temperature readings:

12.50, -0.25, -3.00, -5.25, -6.00, -6.00, -4.75, -4.50, 4.50, -1.25, -3.75, -5.75, -6.50, -7.00, -6.50, -4.75, -1.00, -2.75, -5.50, -6.75, -6.75, -6.00, -6.25, -6.00,

Ln 30, Col 2 | Arduino Uno on COM11

Fig 5.6 Serial Monitor output of GRID EYE SENSOR placed at COOL object (-3 degrees)



Fig 5.7 Serial Plotter output of GRID EYE SENSOR placed at COOL object (0.25 degrees) in graph

5.2 SYSTEM OPERATION

In conclusion, the Alive Human Detection Robot using Grid-EYE Sensor controlled by Bluetooth is a promising project that can have a significant impact in disaster response and prevention, public health, and security. The project involves the integration of several technologies, including thermal sensing, robotics, microcontrollers, and wireless communication, and requires skills in electronics, programming, and mechanical engineering.

The Grid-EYE sensor provides an effective and reliable way to detect human presence based on changes in temperature, while the Bluetooth communication allows for wireless control and monitoring of the robot. The mobility of the robot, enabled by DC motors and wheels, allows for effective detection of humans in different environments, particularly in disaster-stricken areas.

The project has the potential for various applications beyond disaster response, such as monitoring the temperature of crowded areas to prevent the spread of diseases or surveillance systems for security purposes. Additionally, the project provides an opportunity to learn and apply different skills and knowledge in the fields of robotics, sensor technology, and wireless communication.

The robot is controlled by Bluetooth app to control the motion at disaster prone areas and it can move forward, backward, left and right using the controls and we can connect to our robot by downloading an external app to control which are generally available in play store or Appstore.

In summary, the Alive Human Detection Robot using Grid-EYE Sensor controlled by Bluetooth is a valuable project that can contribute to addressing various societal challenges and provides a great opportunity for learning and innovation.

Infrared radiation with a wavelength of 8 to 12 micrometers are emitted by the human body. When the GRID EYE When a sensor picks up a signal, it uploads the information to output and uses a microcontroller to respond to the rescue crew. For various safety precautions, the information is transmitted over Bluetooth to the rescue crew. Offering a sensor suite for human detection in an urban disaster situation was the aim of this research.

5.3 APPLICATIONS

1. In military applications to detect the presence of intruders.
2. In rescue operations where human reach is impossible.
3. In disaster and crisis management.
4. This equipment can be used at mines, earthquake prone place etc

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

The objective of this article is to design a low-cost person detection robot for rescue operations in underdeveloped nations. The created robot has Bluetooth control, making it easier for users to operate. The system is made dependable inside the disaster region by using a BLE module for data transport. Despite the fact that there are numerous Urban Search and Rescue (USAR) rescue robots with numerous sensors and functionalities, they are highly expensive. The purpose of the Human Detection Robot is to give users more protection by defending their possessions from thieves. Rescuers will find it much easier to locate people at catastrophe areas with the aid of this method. Additionally, this is a user-friendly, cost-effective, semi-autonomous, and effective technology for the detection of people.

The project's sensors are reasonably priced, widely accessible, and trustworthy. To save power and improve the efficiency of rescue operations, the authors created a system with human-level sensing. The first is a GRID eye sensor that locates people using their radiated infrared waves and alerts the rescue squad via cloud using a microcontroller. The two tiers of the human detecting system make the system dependable for rescue operations.

6.2 FUTURE SCOPE

- During the crisis circumstances and particularly in metropolitan catastrophes, this undertaking will be an extraordinary prerequisite.
- The disasters can be identified more quickly, and the rescue effort will arrive on the scene to assist the affected individuals.
- The creation of this gadget will be easy to use and high level in innovation.
- The Expansion of arachnid leg robot will be fit to the task as bug leg bots are agreeable to move through trash

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APPENDIX

SOURCE CODE FOR AMG8833

```
#include <Wire.h>
#include <Adafruit_AMG88xx.h>

Adafruit_AMG88xx amg;

void setup() {
  Serial.begin(9600);
  while (!Serial) {
    delay(10);
  }

  if (!amg.begin()) {
    Serial.println("Could not find a valid AMG8833 sensor, check wiring!");
    while (1);
  }
}

void loop() {
  float pixels[AMG88xx_PIXEL_ARRAY_SIZE];
  amg.readPixels(pixels);

  Serial.println("Temperature readings:");
  for (int i=0; i<AMG88xx_PIXEL_ARRAY_SIZE; i++) {
    Serial.print(pixels[i]);
    Serial.print(", ");
  }
  Serial.println();

  delay(500);
}
```

SOURCE CODE FOR BLUETOOTH

```
#define IN1 2
#define IN2 3
#define IN3 4
#define IN4 5

void setup() {
  Serial.begin(9600);
  pinMode(IN1, OUTPUT);
  pinMode(IN2, OUTPUT);
  pinMode(IN3, OUTPUT);
  pinMode(IN4, OUTPUT);
}
```

```

}

void loop() {
  if (Serial.available() > 0) {
    char value = Serial.read();
    Serial.println(value);

    if (value == 'U') {
      Forward();
    } else if (value == 'D') {
      Backward();
    } else if (value == 'S') {
      Stop();
    } else if (value == 'L') {
      Left();
    } else if (value == 'R') {
      Right();
    }
  }
}

void Forward() {
  digitalWrite(IN1, HIGH);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, HIGH);
  digitalWrite(IN4, LOW);
}

void Backward() {
  digitalWrite(IN1, LOW);
  digitalWrite(IN2, HIGH);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, HIGH);
}

void Stop() {
  digitalWrite(IN1, LOW);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, LOW);
}

void Left() {
  digitalWrite(IN1, HIGH);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, HIGH);
}

void Right() {
  digitalWrite(IN1, LOW);
  digitalWrite(IN2, HIGH);
  digitalWrite(IN3, HIGH);
  digitalWrite(IN4, LOW);
}

```

