

SOCCER DRONE

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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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
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SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of N S S L V S SRINIVAS (37130393) and S. LOKESH CHINNAPPA REDDY (37130380), who carried out the project entitled "**SOCCER DRONE**" under my supervision from September 2019 to April 2020.

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DECLARATION

We, N S S L V S SRINIVAS (37130393) and S.LOKESH CHINNAPPA REDDY (37130380) hereby declare that the Project Report entitled “**SOCCER DRONE**” is done by us under the guidance of Mrs. S LAKSHMI, M.E.,(Ph.D) and at SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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ABSTRACT

A quadcopter can achieve vertical flight in a stable manner and be used to monitor or collect data in a specific region such as loading a mass. Technological advances have reduced the cost and increased the performance of the low power microcontrollers that allowed the general public to develop their own quadcopter. The goal of this project is to build, modify, and improve an existing quadcopter kit to obtain stable flight, gather and store GPS data, and perform autocommands, such as auto-landing. The project used an Aeroquad quadcopter kit that included a frame, motors, electronic speed controllers, Arduino Mega development board, and sensor boards and used with the provided Aeroquad software. Batteries, a transmitter, a receiver, a GPS module, and a micro-SD card adaptor were interfaced with the kit. The Aeroquad software was modified to properly interface the components with the quadcopter kit. Individual components were tested and verified to work properly. Calibration and tuning of the PID controller was done to obtain proper stabilization on each axis using custom PID test benches. Currently, the quadcopter can properly stabilize itself, determine its GPS location, and store and log data. Most of the goals in this project have been achieved, resulting in a stable and maneuverable quadcopter.

This web-GIS map will allow state government policymakers, drone hobbyists, and other members of the public to see where it is appropriate to use drones in Maryland.

Visualizing and making drone use data universally available will reduce accidental drone trespassing and will guide users to where drone fly-zones areas are located. To achieve this goal, a geodatabase was designed with five feature classes to show the required data and steps necessary to catalogue and display drone use data properly. A web-GIS map was then constructed that allows users to differentiate between types of fly zones and obtain details regarding the permissibility of drone flight in these zones. This geodatabase, coupled with the web-GIS map of appropriate and inappropriate drone use fly-zones, provides an effective model for other states to use to create their own drone use maps.

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LIST OF ABBREVIATIONS

VLSI	-	VERY LARGE-SCALE INTEGRATION CIRCUITS
HDL	-	HARDWARE DESCRIPTION LANGUAGE
VHDL	-	VHSIC HARDWARE DESCRIPTION LANGUAGE
VHSIC	-	VERY HIGH-SPEED INTEGRATED CIRCUITS
IEEE	-	INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS.
VITAL	-	VHDL INITIATIVE TOWARDS ASK LIBRARIES
RTL	-	REGISTER TRANSFER LANGUAGE
WAVES	-	WAVEFORM AND VECTOR EXCHANGE TO SUPPORT DESIGN AND TEST VERIFICATION.
PLA	-	PROGRAMMABLE LOGIC ARRAY
PAL	-	PROGRAMMABLE ARRAY LOGIC
CPLD	-	COMPLEX PROGRAMMABLE LOGIC DEVICES
CLB	-	CONFIGURABLE LOGIC BLOCKS
ISE	-	INTEGRATED SOFTWARE ENVIRONMENT
EDA	-	ELECTRONIC DEVICES AUTOMATION
FPGA	-	FIELD PROGRAMMABLE GATE ARRAY
PDA	-	POWER DELAY PRODUCT
EDD	-	ERROR DETECTION DELAY
IOT	-	INTERNET OF THINGS
M2M	-	MACHINE TO MACHINE
PAN	-	PERSONAL AREA NETWORK
WAN	-	WIDE AREA NETWORK

CHAPTER 1

INTRODUCTION

A commentary in US journal War on The Rocks defined **drone swarms** as "multiple unmanned platforms and/or weapons deployed to accomplish a shared objective, with the platforms and/or weapons autonomously altering their behaviour based on communication with one another.

The Soccer Drone means the drone is controlled by two remotes. Here we have two controllers to control the drone. Basically, drones are controlled by a single controller. But in this the drone is to be controlled by two controllers using master and slave algorithm. At first the drone is started and fly in the air. Later the drone is controlled by a first controller. Whenever the drone is controlled by a first controller, the drone is in control of 1st controller. If the 1st controller delays by 3 sec, then the control goes to 2nd controller.

Recreational use is increasing as well: for less than 50 Euros a small remote- controlled quadcopter can be bought to fly around in your living room or garden. In these situations, the quadcopter is usually in free flight. There is no physical contact between the surroundings and the quad copter and no cooperation between the quadcopters. If they would have the capabilities to collaborate the number of possibilities grows even further. For example, a group of Drones would be able to efficiently and autonomously search a missing person in a large area by sharing data between. Or, the combined load capacity of a group of quadcopters can be used to deliver medicine in remote areas. This bachelor thesis focuses on the use of a commercially available quadcopter platform, the Drone, to perform a task that requires physical collaboration and interaction: moving a mass. In this way a clear interaction between the quadcopters and their surroundings is present.

As preliminary step towards the view of collaborating aerial robots the choice was made to perform this task in an indoor scenario where position feedback is present. Starting off with position control, additional controller logic can be implemented to counteract the forces imposed by a mass connected to the quadcopter. The choice is made for the Drone, a generalized approach is chosen where possible to encourage reuse of this research's outcome and deliverables.

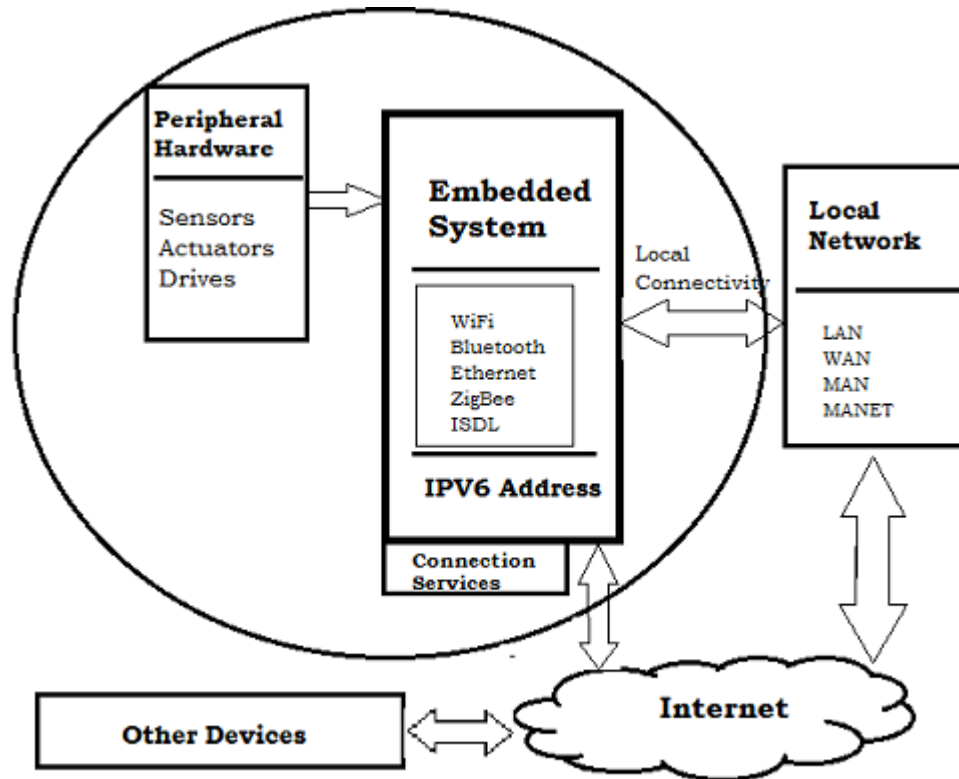
A drone is a flying vehicle which uses rapidly spinning rotors to push air downwards, thus creating

a thrust force keeping the helicopter aloft. Conventional helicopters have two rotors. These can be arranged as two coplanar rotors both providing upwards thrust, but spinning in opposite directions (in order to balance the torques exerted upon the body of the drone).

1.1 WHAT IS IOT?

The [Internet of Things \(IoT\)](#) is defined as a process in which objects are equipped with sensors, actuators, and processors that involve hardware board design and development, software systems, web APIs, and protocols, which together create a connected environment of embedded systems. This connected environment allows technologies to get connected across multiple devices, platforms, and networks, creating a web of communication that is revolutionizing the way we interact digitally with the world. This connected [embedded systems](#) are changing interactions and behavior with our environment, communities, and homes, and even with our own bodies.

There are embedded systems around us in the form of commercial systems like vending machines, smart kiosks, AC controller, connected cars, hotel bill printers, etc., which are capable of performing a unique variety of operations. Hence, when it comes to designing of these embedded IoT systems, they need to be designed for specific functions, possessing qualities of a good product design like low power consumption, secured architecture, reliable processor, etc. However, designing an embedded IoT hardware system is not easy.



Internet of Things (IoT)

Fig 1.1 Embedded system in IOT

The embedded system can be of type microcontroller or type microprocessor. Both of these types contain an integrated circuit (IC). The essential component of the embedded system is a RISC family microcontroller like Motorola 68HC11, PIC 16F84, Atmel 8051 and many more. The most important factor that differentiates these microcontrollers with the microprocessor like 8085 is their internal read and writable memory. The essential embedded device components and system architecture are specified below.

1.2 INTRODUCTION TO EMBEDDED SYSTEMS:

An embedded system is a microprocessor-based computer hardware system with software that is designed to perform a dedicated function, either as an independent system or as a part of a large system. At the core is an integrated circuit designed to carry out computation for real-time operations.

An embedded system is a microprocessor-based computer hardware system with software that is designed to perform a dedicated function, either as an independent system or as a part of a large system. At the core is an integrated circuit designed to carry out computation for real-time

operations.

Complexities range from a single microcontroller to a suite of processors with connected peripherals and networks; from no user interface to complex graphical user interfaces. The complexity of an embedded system varies significantly depending on the task for which it is designed.

Embedded system applications range from digital watches and microwaves to hybrid vehicles and avionics. As much as 98 percent of all microprocessors manufactured are used in embedded systems.

The basic structure of an embedded system includes the following components:

Sensor: The sensor measures and converts the physical quantity to an electrical signal, which can then be read by an embedded systems engineer or any electronic instrument. A sensor stores the measured quantity to the memory.

A-D Converter: An analog-to-digital converter converts the analog signal sent by the sensor into a digital signal.

Processor & ASICs: Processors assess the data to measure the output and store it to the memory.

D-A Converter: A digital-to-analog converter changes the digital data fed by the processor to analog data

Actuator: An actuator compares the output given by the D-A Converter to the actual output stored and stores the approved output.

CHAPTER 2

LITERATURE SURVEY

2.1 Oehmichen

Etienne Oehmichen experimented with rotorcraft designs in the among the six designs he tried, his helicopter No.2 had four rotors and eight propellers, all driven by a single engine. The Oehmichen No.2 used a steel-tube frame, with two-bladed rotors at the ends of the four arms. The angle of these blades could be varied by warping. Five of the propellers, spinning in the horizontal plane, stabilized the machine laterally. Another propeller was mounted at the nose for steering. The remaining pair of propellers were for forward propulsion.

The aircraft exhibited a considerable degree of stability and controllability for its time, and made more than a thousand test flights during the middle . By it was able to remain airborne for several minutes at a time, and it established the first-ever FAI distance record for helicopters of 360 m (390 yd). It demonstrated the ability to complete a circular course and later, it completed the first 1 kilometer (0.62 mi) closed-circuit flight by a rotorcraft.

2.2 De Bothezat helicopter

Dr. George de Bothezat and Ivan Jerome developed this aircraft, with six bladed rotors at the end of an X-shaped structure. Two small propellers with variable pitch were used for thrust and yaw control. The vehicle used collective pitch control. Built by the US Air Service, it made its first flight in October . About 100 flights were made by the end . The highest it ever reached was about 5 m (16 ft 5 in). Although demonstrating feasibility, it was underpowered, unresponsive, mechanically complex and susceptible to reliability problems. Pilot workload was too high during hover to attempt lateral motion.

2.3 Convert wings Model A Quadrotor

This unique helicopter was intended to be the prototype for a line of much larger civil and military quadrotor helicopters. The design featured two engines driving four rotors through a system of v belts. No tail rotor was needed and control was obtained by varying the thrust between rotors. Flown successfully many times, this helicopter proved the quadrotor design and it was also the first four-rotor helicopter to demonstrate successful forward flight. Due to a lack of orders for commercial or military versions however, the project was terminated. Convert a wing proposed a Model E that would have a maximum weight of 42,000 lb (19 t) with a payload of 10,900 lb (4.9 t) over 300 miles and at up to 173 mph (278 km/h).

2.4 Curtiss-Wright VZ-7

The Curtiss-Wright VZ-7 was a VTOL aircraft designed by the Curtiss-Wright company for the US Army. The VZ-7 was controlled by changing the thrust of each of the four propellers. AR.Drone is a small radio-controlled quadcopter with cameras attached to it built by Parrot SA, designed to be controllable with by smartphones or tablet devices. Nixie is a small camera equipped drone that can be worn as a wrist band.

Had 4 rotors and 8 propellers all driven by one motor Over 1000 Successful flights

First recorded FAI distance record of 360m for a helicopter Very Stable for the Time

Designed by Etienne Oemichen.

2.5 Current Development

As we have seen how the master and slave algorithms work Industries, Machines etc., The algorithm that we are going to implement in drones. In Master and slave, when one machine is working the working machine act as a master. The remaining machines are act as a slave and which act as a slave it doesn't work. Whenever the master is idle for certain period of time, then the thing which act a master will become slave and the master control went to the next thing. The same thing we are going to implement now in remote controls.

CHAPTER 3

EXISTING SYSTEM

EXISTING SYSTEM:

- More Critical Path Delay
- More Cost and Complexity
- Low Search Performance

PROPOSED SYSTEM:

- Less Critical Path Delay
- Low Cost and Complexity
- High Search Performance

3.1 AIM

Here the title “SOCCER DRONE” suggests that the drone controlling will move from one hand to another. With the help of this the drone controllers will achieve their goal.

In these the drone acts like soccer and the drone controllers are players.

With these they will catch the culprit or anything that gone missing is the goal.

Suppose, if the culprit is missing in a particular area these two drone controllers are two sides of that area. So by this they can capture in drone camera and catch the culprit.

3.2 SCOPE

Drones plays an important role in security purposes. If any culprit or thief is escaping from a city or anyone missed in the areas like deserts, lands and non-availability of security camera areas drones plays an important role in searching. But drones also have certain range of frequencies. Due to that frequency range the drone may lost the signals. So that it is difficult to find the culprit or missing case.

In order to avoid that situation, we designed a “Soccer Drone” which is also known as dual remote-control drone. Whenever the culprit or thief or anybody missing, then the cops are covered by the two sides of a culprit. Then the remotes are in the hands of both sides of cops. Whenever the culprit is running on the either side of the cops then the master control of drone is

handover to the either side of the cops to which the culprit is running. Then it is easy to find the culprit ora missing case very fast.

For the search and rescue operation, the seek area is first divided into subfield such that each SD can fly whole area in the flight time. The SD can be considered as an explorer of the system.

Each SD is responsible for the one subfield and it has to report data to the MD.

Operating in large areas could present challenges in communication between SDs and CC.

The MD can be considered as a data pathway. The proposed model is based on MD.

The data from the each subfield is transmitted to CC via MD. Thanks to MD, drones can set up temporary secure communication networks. To increasement the trustworthy, the data is controlled in two place; MD and CC where the place is respectively middle and end of the communications path. MD also coordinates and positions SDs. CC allows the user to monitor and analyze the drone parameters like battery information, coordinates and sensor data.

The communication package consist of Drone ID, password, coordinates, sensor values and CRC test function result . Each drone has a specific ID number. Each datapath between SDs and MD has its own unique password. The drones that use a datapath have to add the datapath's password to the data packet. MD checks the password field before processing the incoming data. If the incoming password is the same as the password of the data path, data transmission is performed. The coordinates of the each drone is the necessary and most significant information for the coordinate the whole network. The data transmitted by the transmitter to the network are checked with the cyclic redundancy check (CRC) to determine whether the receiver received the same data from the network. In the CRC method, the data is processed through a predetermined function such as addition, subtraction, deconvolution before the transmission. The function results are written in the CRC field of the resulting packet structure. The receiver applies the same function without receiving the data and compares it with the value of the resultant CRC field. If the calculated CRC and received CRC is the same, it indicates that the data is transmitted without errors from SD to CC.

The protocol used is divided into the physical layer and MAC layer. The network structure designed in this study can be thought of as wireless sensor networks. In wireless sensor applications, it is important to reduce the energy consumption of the nodes to the minimum, just like in the drone.

CHAPTER 4

PROPOSED

4.1 Embedded systems in the Internet of Things:

The growth potential for the embedded industry is enormous. And the path forward is becoming clearer every day. It's time that we start building IoT systems, and provide value to our customers. The Internet of Things (IoT) is no longer a fanciful vision. It is very much with us, in everything from factory automation to on-demand entertainment.

IoT software solutions have largely had to be built from scratch with a high degree of customization to specific requirements, which has driven up the cost and complexity of development and deterred many prospective entrants to the market. What have been missing are developer tools that alleviate the costs associated with building the foundational infrastructure—the “plumbing” of their solutions—so they can focus on optimizing the core functionality and bring solutions to market more quickly with less cost.

Benison Technologies is addressing these challenges with new solutions that have the potential to expand the market for IoT by reducing the cost and complexity of development.

4.2 Embedded Systems and Real-time Operating Systems (RTOS)

Embedded systems are highly customized, developed and programmed as per user requirements. Conventional embedded systems are electronic components that possess a microprocessor, peripherals, memory card, and software program that run instructions, operating system and tools (debuggers, static and non-programmable), and follows firmware programming embedded in the micro-chip.

Embedded systems will play an important role in Internet of Things (IoT) due to their unique characteristics and features such as real time computing, low power consumption, low maintenance and high availability are becoming the key enabler of IoT. Major players in embedded system hardware and software developments are aiming to bring these transformations into their products to take advantage of growing IoT market.

The areas that are going to transform are Real Time Operating Systems (RTOS) and microprocessors and microcontrollers, followed by memory footprints and networking, open source communities and developers.

Smart embedded systems will require changing contemporary embedded system design and architecture to suit real-time operations, smaller size of the unit and lowered power consumption

and become cost efficient.

Use of microcontroller and technologies such as Systems on Chip (SoC) and Reduced Instruction set Computing Chips (RISC) will have greater scope in IoT.

Related to embedded systems is Real-time Operating Systems (RTOS), which is an OS that manages hardware resources, hosts applications, and processes data on real-time basis. RTOS defines the real time task processing time, interrupt latency, and longer period reliability of both hardware and applications, especially for low powered and memory constrained devices and networks.

The key difference between RTOS and a general purpose OS lies within its high degree of reliability and consistency on timing between application's task acceptance and completion.

4.3 Purpose of Internet of Thing

The main purpose of IoT is to create an ecosystem that connects everything. An ecosystem where everything is connected to each other is known as the Internet of Everything.

The IoT Eco-system enables the entities to connect and control the IoT devices present in the network .

In case of an IoT Eco-system, the entity can use a remote (tablets, smartphones, Drones) for sending a command or request for information over an IoT device

The device then performs the command or can even send the information back over the network which has to be analyzed

This storing and analyzing of data can be carried out in multiple locations which include- cloud, local database or sometimes the data himself.

DRONES...A SMART LIFT FOR SENSORS

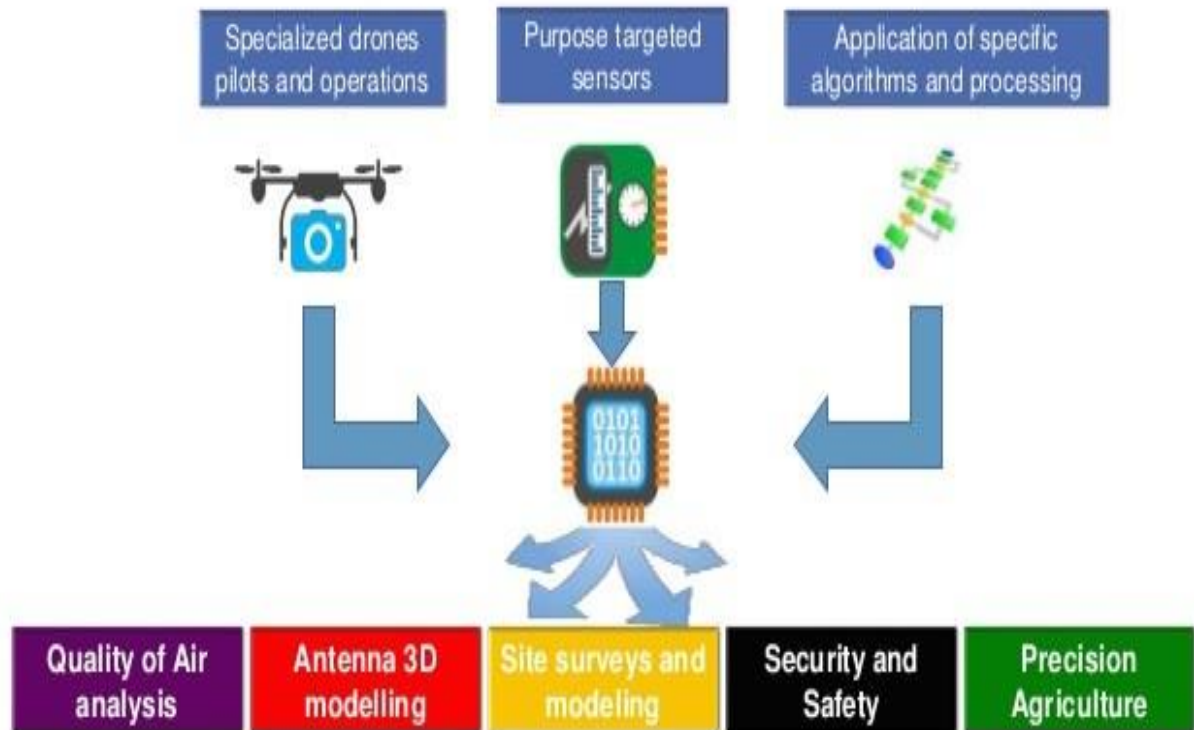


Fig 4.1 Drones, Smart lift for sensors

CONCLUSION:

Just as the Internet of Things presents businesses in all industries with opportunities for innovation, it also presents tremendous opportunities for developers of embedded systems and IoT solutions. Developers who can meet the demand for reliable, secure, and readily manageable IoT solutions, quickly and at a fair cost, are the ones who stand to benefit. Benison Technologies IoT-optimized solutions, backed by industry-leading expertise in embedded technology, give developers the competitive edge needed to capitalize on opportunities in this rapidly growing market.

4.4 PURPOSE OF DRONES:

Drones are used for various purposes. They are:

1. For rescue operations
2. First Aid drones
3. For agricultural applications
4. In Military Operations

4.4.1 For Rescue Operations:

As we have seen in the real-life anecdote shared at the beginning of this post, drone technology is ideal for search and rescue missions. Drones can reach remote areas faster than people or vehicles. They can quickly get to areas that are impassible by vehicle, too expansive to be traversed on foot, or too remote or risky. Additionally, they can fly over search areas with lights, sensors and cameras, and can identify heat signatures that locate living beings using infrared technology.

Additionally, as indicated in the image, search and rescue drones can deliver flotation devices and lifesaving supplies, such as food, water, rope, life jackets, inflatables or life preservers. For example, a company called Urban drones develops drones that deliver life preservers that automatically inflate.

The technology equipping drones to perform lifesaving missions is quickly on the rise. Even private drones are making an enormous impact in search and rescue. An Aero Society article reported survey results showing that civilian drones are now saving one life per week on average.



Fig 4.2 Rescue Drone

4.4.2 First Aid Drones:

Ambulance getting stuck in traffic has resulted in countless precious lives. Statistics have shown that especially in the Indian traffic conditions the chances of such scenarios are at peak. In this paper we are providing a solution to speed up the delivery procedure of first aid kit in situations including but not limited to (i) Ambulance getting stuck in traffic, (ii) War torn regions with limited medical supply etc. From the minor ailment to the more serious injury a first aid kit can help reduce the risk of infection or the severity of the injury. With drones changing the face of human technology, it can be used in the medical field to assert timely delivery of essential first aid to people in not easily accessible regions. When the user books an ambulance for the victim, if the ambulance is stuck in traffic, Automated drones can deliver personalized first aid kit to the user location so that the victim can be diagnosed by the remedy medicines with assistance of doctor using web app till the ambulance arrives to the victim location and takes the victim to hospital. Users can also request pharmacy for immediate remedy medicines in case of emergency.



Fig 4.3 First Aid Drone

4.4.3 Agricultural Drones:

An **agricultural drone** is an unmanned aerial vehicle used to help optimize agriculture operations, increase crop production, and monitor crop growth. Sensors and digital imaging capabilities can give farmers a richer picture of their fields. Using an agriculture drone and gathering information from it may prove useful in improving crop yields and farm efficiency.

The aerial view provided by a drone can reveal many issues such as irrigation problems, soil variation, and pest and fungal infestations. Multispectral images show a near-infrared view as well as a visual spectrum view. The combination shows the farmer the differences between healthy and unhealthy plants, a difference not always clearly visible to the human eye. Thus, these views can assist in assessing crop growth and production. Crops can be surveyed at any time using agricultural drones, allowing for rapid identification of problems.



Fig 4.4 Agricultural Drone

4.4.4 Military Drones:

The ever-changing threat landscape across military domains means that armed forces need to stand ready to protect and defend, often at short notice, to be ready for anything. Honeywell has a long, proud and proven history of enabling our military customers to maintain mission readiness, to count on superior capability borne from the application of our innovative technology solutions, and to rely on us to achieve mission objectives now and in the future.

Our broad range of technologies enable helicopters to fly higher, hotter and more fuel efficiently, airborne assets to benefit from fast, reliable and secure network connections, bases to become more digital and connected, aircraft to fly safely, even in bad weather and at night, Fast Jet pilots to rely on clean, safe air-supply, Unmanned Aerial Systems to fly for longer, more safely, and so much more.

We are committed to you, our military customers and stand ready to support you, whatever your requirements may be. From defending your national interest, supporting the need for security of supply with local depot set-up and technology transfer, to providing training, localised support and guidance to reduce downtime and maintain mission-readiness wherever you are in the world. You can rely on us.



Fig 4.5 Military Drone

Chapter -5

RESULT AND DISCUSSION

5.1 Components:

1. Frame
2. Motor x4
3. Electronic Speed Control (ESC) x4
4. Flight Control Board
5. Radio transmitter and receiver
6. Propeller x4 (2 clockwise and 2 counter-clockwise)
7. Battery & Charger.

Frame:

Every quadcopter or other multirotor aircraft needs a frame to house all the other components. Things to consider here are weight, size, and materials. We recommend the DJI Flame Wheel F450 or one of the many clones. These are great quadcopter frames. Check out our review of the Flame Wheel F450 [here](#). They're strong, light, and have a sensible configuration including a built-in power distribution board (PDB) that allows for a clean and easy build. There are also a ton of spare parts and accessories available from many different websites. There are also a ton of clones out there, most of which include the same built-in PDB and durable construction as the original. Parts and accessories are 100% compatible and interchangeable. Here's one available on Amazon with Prime shipping.



Fig 5.1 Frame

Motors:

The motors have an obvious purpose: to spin the propellers. There are tons of motors on the market suitable for quadcopters, and usually you don't want to get the absolute cheapest motors available, but you also don't want to break the bank when some reasonably priced motors will suffice. Motors are rated by kilovolts, and the higher the kV rating, the faster the motor spins at a constant voltage. When purchasing motors, most websites will indicate how many amps the ESC you pair it with should be and the size of propeller you should use. We have found that a 1000kV motor is a good size to start with.



Fig 5.2 motor

Electronic Speed Controls:

The electronic speed control, or ESC, is what tells the motors how fast to spin at any given time. You need four ESCs for a quadcopter, one connected to each motor. The ESCs are then connected directly to the battery through either a wiring harness or power distribution board.

Many ESCs come with a built-in battery eliminator circuit (BEC), which allows you to power things like your flight control board and radio receiver without connecting them directly to the battery. Because the motors on a quadcopter must all spin at precise speeds to achieve accurate flight the ESC is very important.

These days if you are building a quadcopter or other multirotor, it is pretty much standard to use ESCs that have the Simonek firmware on them. This firmware changes the refresh rate of the ESC so the motors get many more instructions per second from the ESC, thus have greater control over the quadcopter's behavior. Many companies sell ESCs that have the Simonek firmware already installed.

In drone applications, the drone could send data using telemetry devices or radio frequency module which has a limited range. So, there is no interaction between user and drone after a certain range. In this study, a hierarchical tree topology based wireless drone network is designed and presented to overcome range challenge. Proposed network consists of three main parts; Control Center (CC), Master Drone (MD) and Slave Drones (SDs). The CC as a network manager communicates with just MD via telemetry devices. SDs are explorer drones for the search and rescue application. The data transfer between CC and SDs is provided by MD which is explorer like SDs.

Flight Controller:

The flight control board is the 'brain' of the quadcopter. It houses the sensors such as gyroscopes and accelerometers that determine how fast each of the quadcopter's motors spin. Flight control boards range from simple to highly complex. A great flight control board for first time quadcopter builders is the Hobby King KK2.0. It is affordable, easy to set up, and has strong functionality. It can handle just about any type of multirotor aircraft so if you later want to upgrade to a hex copter or experiment with a Tri copter, you won't need to purchase another board.



Fig 5.3 Flight controller

Transmitter and receiver:

The radio transmitter and receiver allow you to control the quadcopter. There are many suitable models available, but you will need at least four channels for a basic quadcopter with the KK2.0 control board. We recommend using a radio with 8 channels, so there is more flexibility for later projects that may require more channels. The Turing 9x is a great choice for a first radio. It's inexpensive yet still has some advanced functionality.

The seek area is first divided into subfield such that each SD can fly whole area in the flight time. The SD can be considered as an explorer of the system. Each SD is responsible for the one subfield and it has to report data to the MD. Operating in large areas could present challenges in communication between SDs and CC.

There is also a large community of 9x users out there, so troubleshooting is easier. Chances are any problem you have has been experienced and solved before, or someone on a forum like regroups will be able to help you out.



Fig 5.4 Remote controller

Propellers:

A quadcopter has four propellers, two “normal” propellers that spin counter- clockwise, and two “pusher” propellers that spin clockwise. The pusher propellers will usually be labeled with an ‘R’ after the size. For the quadcopter configuration in this post, we’re using 9×4.7 props. This is a good size for the motors and ESCs we’re using.



Fig 5.5 Propellers

Battery:

Quadcopters typically use LiPo batteries which come in a variety of sizes and configurations. We typically use 3S1P batteries, which indicates 3 cells in parallel. Each cell is 3.7 volts, so this battery is rated at 11.1 volts. LiPo batteries also have a C rating and a power rating in Mah (which stands for milliamps per hour). The C rating describes the rate at which power can be drawn from the battery, and the power rating describes how much power the battery can supply.

Larger batteries weigh more so there is always a tradeoff between flight duration and total weight. A general rule of thumb is that doubling the battery power will get you 50% more flight time, assuming your quadcopter can lift the additional weight.



Fig 5.6 Battery

Battery Charger:

Charging LiPos is a complex process, because there are usually multiple cells within the battery that must be charged and discharged at the same rate. Therefore, you must have a balance charger.

There are many chargers on the market that will do the job, but be careful of cheap or off-brand chargers as many of them have faulty components and can cause explosions or fires.

In general, you should absolutely never leave LiPo batteries charging unattended. Many people charge batteries outside on a cement area or in a fireproof LiPo bag (although the effectiveness of these is up for debate). . It is affordable but reliable. Be wary of knock-offs.

The competition based model is used for the proposed network. Carrier Sensing Multiple Access (CSMA) technique is used for channel access. With CSMA, a node listens to the communication channel before sending the packet to the network, and sends packets to the network if the channel is not being used by another node . The main disadvantage of the CSMA technique is that some nodes can not detect the packet transmission. This problem causes multiple nodes to send packets at the same time and cause collision problem . To solve this problem, collision avoidance carrier sensitive multiple access (CSMA / CA) technique has been developed.



Fig 5.7 Battery charger

For our scenario, The SD1 sends RTS (Request to Send) signal to MD inquire whether the channel is available for the data transfer. If MD is available, CTS (Clear to Send) signal is sent and data transfer between drones is started. After the data transfer is completed, the ACK (Acknowledgement) signal is sent from the receiver to the transmitter. As shown in Figure 5, the SDs compete for the channel access. As a result of the competition, the drone which receives the CTS signal from the MD starts data transmission. Meanwhile, the other drones delay the communication for a certain period of time because of the channel is busy. At the end of this period, the channel will re-listen and if the channel is ready to communicate, a new competitive process will start. In this study, 2 different channels are used for data transfer between SDs and MD and between MD-CC.

5.2 IMPLEMENTATION OF MASTER AND SLAVE ALGORITHM

As we know that Master and slave algorithm is used in many of the industries, machines etc., Now we are going to use it in a remote controller of a drone.

Master/slave is a model of asymmetric communication or control where one device or process (the "master") controls one or more other **devices** or processes (the "slaves") and serves as their communication hub.

In the master/slave communication model, master is a device or a process that has control over other devices or processes, whereas a slave is a device or a process that is controlled by another device (called the master). Here, the device designated as the **master** has no control over the device designated as the slave.

Master/slave is a model of asymmetric communication or control where one device or process (the "master") controls one or more other devices or processes (the "slaves") and serves as their communication hub. In some systems, a master is selected from a group of eligible devices, with the other devices acting in the role of slaves. Historically, the master/slave terminology has existed for decades, although in the 21st century it has been a subject of controversy due to its association with slavery, and some organizations and products have since replaced it with alternative terms.

5.3 EXAMPLES:

In electronics, master/slave relationships are used to describe some of the following scenarios:

In parallel ATA hard drive arrangements, the terms master and slave are used to describe drives on the same cable, but neither drive has control or priority over the other.

- A master clock that provides time signals used to synchronize one or more slave clocks as part of a clock network.
- In AXI, master and slave have differing roles, with master initiating transactions and the slave responding to those transactions.
- D flip-flops can be created by arranging two D latches (master latch and slave latch) in a master-slave configuration. It is named because the master latch controls the slave latch's value and forces the slave latch to hold its value, as the slave latch always copies its new value from the master latch.
- In database replication, the master database is regarded as the authoritative source, and the slave (also called replica) databases are synchronized to it.
- In photography, secondary or slave flash units may be synchronized to the master unit to provide light from additional directions.
- Duplication is often done with several cassette tapes or compact disc recorders linked together. Operating the controls on the master triggers the same commands on the slaves so that recording is done in parallel.
- Railway locomotives operating in multiple (for example: to pull loads too heavy for a single locomotive) can be referred to as a master/slave configuration with the operation of all locomotives in the train slaved to the controls of the first locomotive. See Multiple-unit train control.
- In automotive engineering, the master cylinder is a control device that converts force into hydraulic pressure in the brake system. This device controls slave cylinders located at the other end of the hydraulic system.

Flow diagram of a Remote Controller Model:

Master Controller

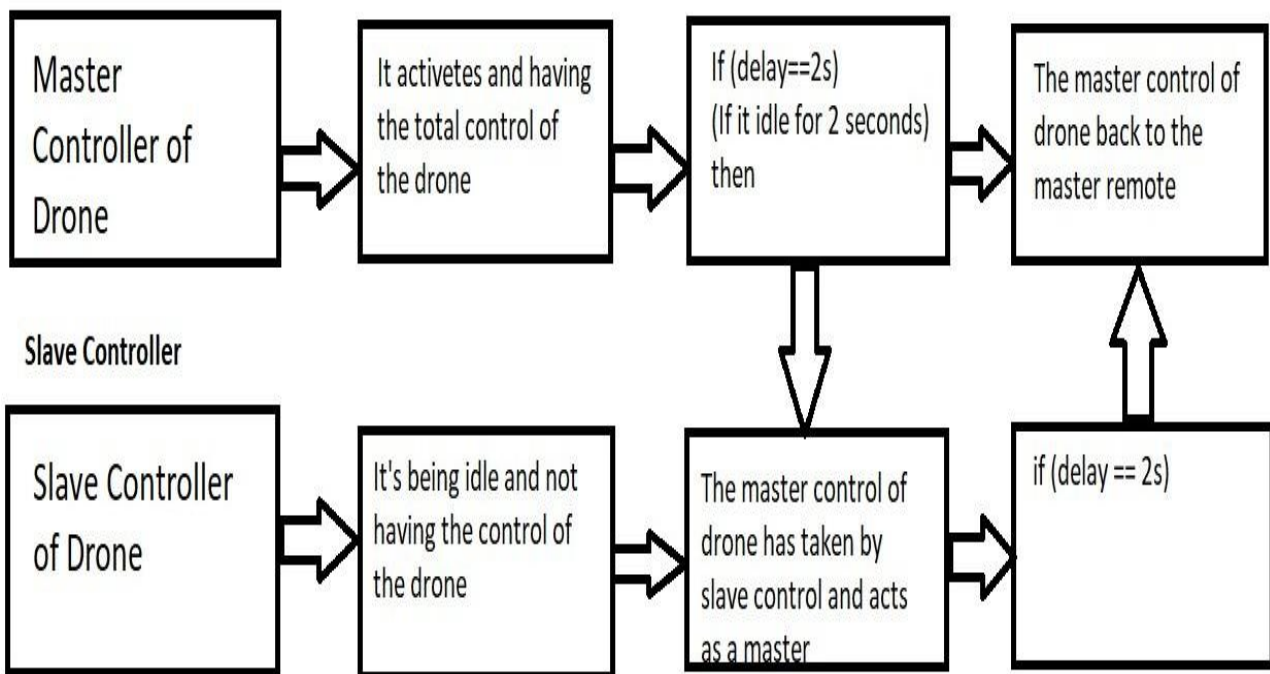


Fig 5.8 Organizing Master slave control in remotes

5.4 Organizing Master and Slave Structures:

We now describe how to organize master and slave kernels from an existing uniprocessor kernel. Recall that the main functions of master kernel include assigning application tasks onto slaves and servicing kernel mode operations requested by slaves. Therefore, it is very straightforward to organize the master kernel's structure. It can be done by incorporating the original uniprocessor kernel with additional components to support the above two functions. The additional components are a global task scheduler and a kernel service handle, which are responsible for task assignment and kernel services, respectively. Fig. 1 shows a typical structure of embedded operating system for uniprocessor and shows the master kernel's structure, where shaded boxes represent added components and white boxes represent native components. In fact, has been taken from our research kernel QURIX intended for uniprocessors and has been taken from our initial version of APRIX.

On the other hand, the seek area is set to a flight time of 15 minutes. It means, drones can fly whole are just 15 minutes. According to the simulation result, the target is found by a drone in about 12 minutes. The calculation of flight times used in the simulation is as follows; in which m is subfield number, X is the dimension of the each subarea and V is the velocity of the each drone.

Performance Optimization Considerations:

In this section, we discuss two important performance issues in the master- slave approach. The first issue is associated with the design choice for remote invocation mechanism. We show that if not properly designed, the remote invocation mechanism may lead to serious performance problems such as indefinite task blocking and priority inversion. We then show that a priority-based approach can overcome these problems. The second issue is closely related with the inherent architectural problem of the master-slave approach. As mentioned earlier, the master may become a hot spot of contention as the number of slaves increases. To tackle this problem, we suggest a component-based kernel architecture and application- specific kernel configuration. slave kernels from an existing uniprocessor kernel. Recall that the main functions of master kernel include assigning application tasks onto slaves and servicing kernel mode operations requested by slaves. Therefore, it is very straightforward to organize the master kernel's structure.

The simulation of the drone networks, it is important that the simulation infrastructure must allow the placement and testing of the same topology that is to be eventually placed on the field. V-REP, a well-known framework for robot software development, fast algorithm development, factory automation simulations, fast prototyping and verification, remote monitoring, have used for the proposed protocol and topology. The network control can be described in Algorithm.

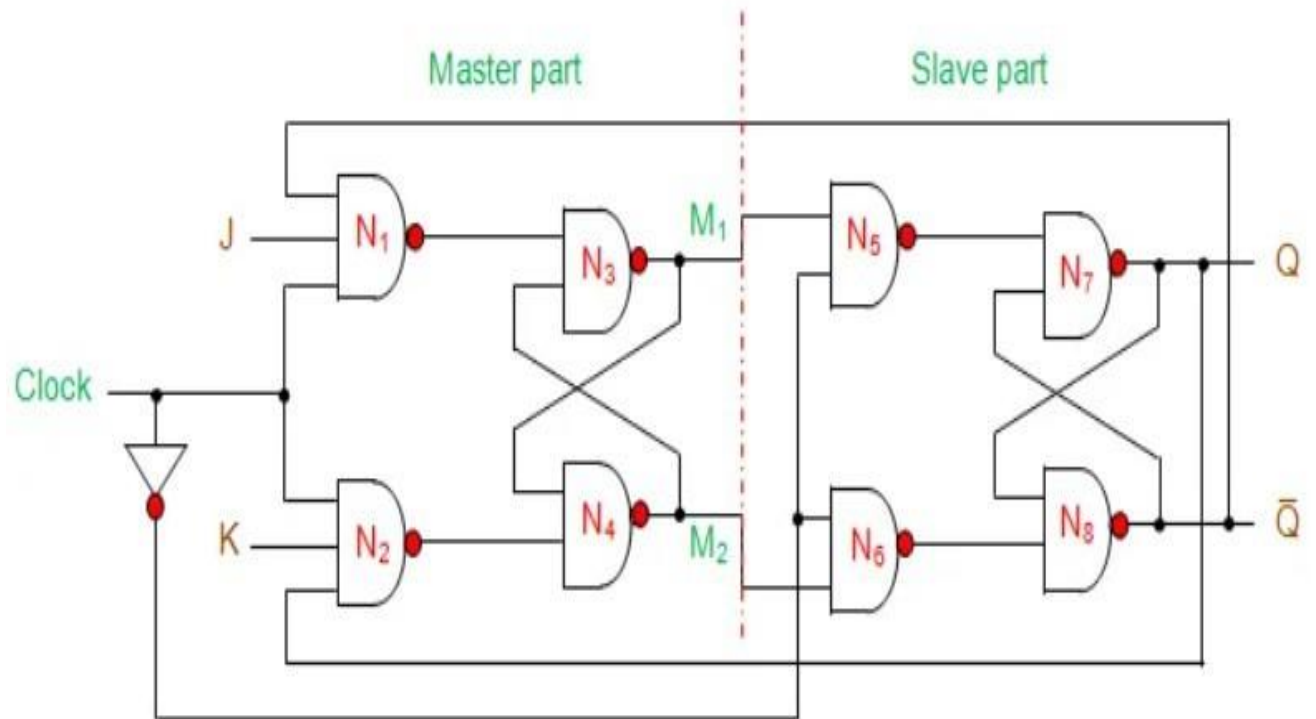


Fig 5.9 Master-Slave Flip Flop realized NAND Gate

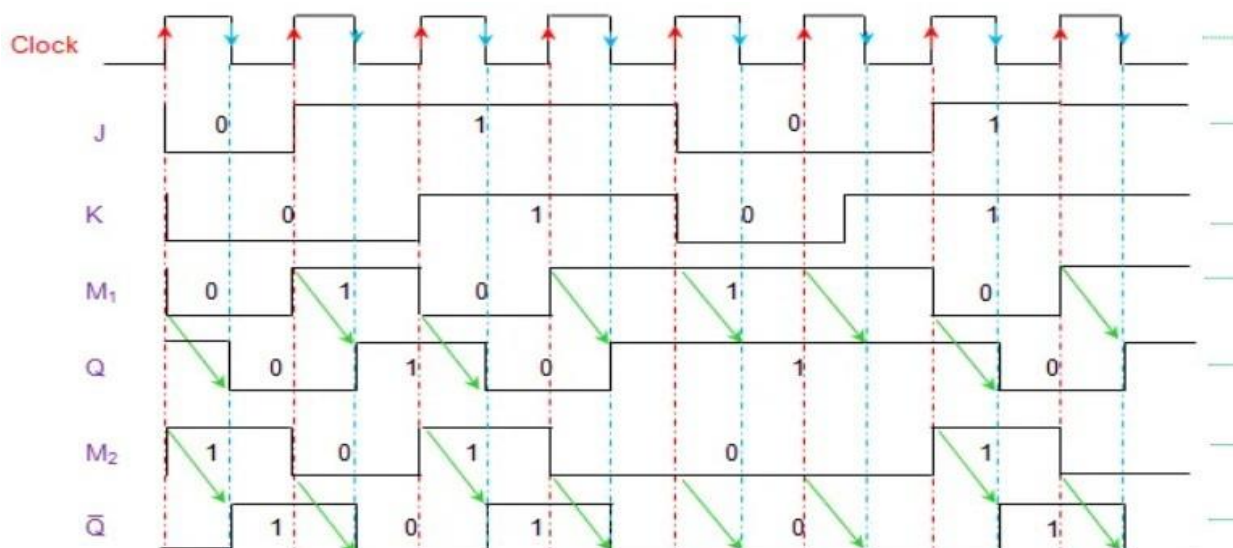
Truth Table

Trigger	Inputs		Output						Inference	
			Present State		Intermediate		Next State			
CLK	J	K	Q	$\bar{Q}$	M ₁	M ₂	Q	$\bar{Q}$		
↑	0	0	0	1	0	1	Latched		No Change	
↓			0	1	Latched	0	1			
↑			1	0	1	0	Latched	1		0
↓			1	0	Latched	1	0			
↑	0	1	0	1	0	1	Latched		Reset	
↓			0	1	Latched	0	1			
↑			1	0	0	1	Latched	0		1
↓			1	0	Latched	0	1			
↑	1	0	0	1	1	0	Latched		Set	
↓			0	1	Latched	1	0			
↑			1	0	1	0	Latched	1		0
↓			1	0	Latched	1	0			
↑	1	1	0	1	1	0	Latched		Toggles	
↓			0	1	Latched	1	0			
↑			1	0	0	1	Latched			
↓			1	0	Latched	0	1			

Table I Truth table for master-slave JK flip-flop

Fig 5.9 Truth table

Fig 5.10 Timing Diagram of Master-slave Flip flop



5.5 Software or Code used:

drone.get_position (): returns the actual position of the drone as a 1×3 NumPyarray [x, y, z], in meters.

drone.get_velocity (): returns the actual velocities of the drone as a 1×3 NumPy array [vx, vy, vz], in m/s.

drone.get_y

drone.get_yaw_rate (): returns the actual yaw rate of the drone, in rad/s.

drone.get_orientation (): returns the actual roll, pitch, and yaw of the drone as a 1×3 NumPy array [roll, pitch, yaw], in rad.

drone.get_frontal_image (): returns the latest images from the frontal camera as an OpenCV image (cv2_image). drone.get_ventral_image (): returns the latest images from the ventral camera as an OpenCV image (cv2_image).

drone.get_landed_state (): returns one if the drone is on the ground (landed), two if it is in the air, and four if landing. Additionally, the HAL API provides these methods for drone control:

drone.set_cmd_vel (vx, vy, vz, yaw_rate): commands the linear velocity of the drone in the x, y, and z directions (in m/s) and the yaw rate (rad/s) in its body-fixed frame.

drone.set_cmd_mix (vx, vy, z, yaw_rate): commands the linear velocity of the drone in the x, y directions (in m/s), the height (z) related to the takeoff point, and the yaw rate (in rad/s).

drone.takeoff (height): takes off from the current location to the given elevation (in meters).

drone.land (): lands at the current location.

TERMINOLOGY CONCERNS:

In 2003, the County of Los Angeles in California asked that manufacturers, suppliers and contractors stop using "master" and "slave" terminology on products; the county made this request "based on the cultural diversity and sensitivity of Los Angeles County". Following outcries about the request, the County of Los Angeles issued a statement saying that the decision was "nothing more than a request". Following the controversy, Global Language Monitor found the term "master/slave" to be the most egregious example of political incorrectness in 2004, and named it the most politically incorrect term of that year.^[8] In 2018, Python replaced the term, after a heated debate. Many developers in the discussion on whether to make the replacement agreed that the term "slave" should be replaced while "master" was not offensive, while others argued that changing "slave" was also unnecessary. There was similarly contentious debate among developers when Django and Drupal (in 2014) and Redis (in 2017) replaced the term. The Black Lives Matter movement sparked that discussion again in 2020. Some have argued that the change is superficial and that companies should make real change to support the black community. See also similar concerns regarding the technology term "Blacklist".

In 2020, the Open Compute Project published *Terminology Guidelines for Inclusion and Openness* which recommends general terminology and commonly used pinout and signal names which to deprecate and suggested replacement terminology.

Replacements

Different phrases have been adopted to replace existing usage of the phrase. Some examples include:

Controller/Agent

Jenkins software project has phased out the words "master/slave" and replaced them with "controller" / "agent".

Primary/Secondary

In December 2017, the Internet Systems Consortium decided to allow the words "primary" and "secondary" as a substitute for master/slave terminology in their DNS server software BIND.

Primary/Replica

In May 2014, Django replaced "master/slave" with "leader/follower" in its documentation, and then within two days replaced that with "primary/replica". In June 2014, Drupal replaced "master/slave" with "primary/replica", drawing inspiration from Django. This has also been adopted by Microsoft and Amazon Web Services/Amazon Relational Database Service.

Master/Replica

The master/replica terminology was adopted by [Engine Yard](#) and [Redis](#).

Source/Replica

In July 2020, [MySQL](#) announced that it would replace "master/slave" with "source/replica" in future releases.

Master/Standby

The master/standby terminology was adopted by [PostgreSQL](#).

Master/Minion

The master/minion terminology was adopted by [Salt](#).

Provider/Consumer

The provider/consumer terminology was adopted by [OpenLDAP](#).

Master/Puppet

The master/puppet terminology was adopted by [Godot Engine](#).

Controller/Peripheral

In June 2020, the [Open Source Hardware Association](#) resolved to discontinue terms such as MOSI/MISO used for the [SPI bus](#), instead opting for the acronyms COPI/CIPO, though this group is not the owner of the SPI bus specification.

Initiator/Follower

The [HDMI](#) specification is using "Initiator" and "Follower" for the [CEC](#) communication protocol.

Main

[GitHub](#) made the switch from "master" to "main" in October 2020.

Client/Server

The [Modbus Organization](#) replaced "Master-Slave" with "Client-Server" in July 2020.

Source/Min

In 2021, [Adobe](#) updated the terminology included in their [Creative Cloud](#) suite of apps, replacing "master" with "source" or "mix", or in some cases outright removing the term, as well as replacing the term "blacklist" with "blocklist".

Main-Parent-Server/Worker-Child-Helper

In 2018, [Python](#) replaced uses of the term "master" variously with "main", "parent", and "server"; and "slave" with "worker", "child", and "helper", depending on the context. The [Linux](#) kernel has adopted a similar policy to use more specific terms in new code or documentation.

5.6 RESULT

Drone Flying:

The drone can fly extent up to a height of 5 meters from the above the surface of the Earth.

The spatial frequency domain is interesting because: 1) it may make explicit periodic relationships in the spatial domain, and 2) some image processing operators are more efficient or indeed only practical when applied in the frequency domain.

In most cases, the Fourier Transform is used to convert images from the spatial domain into the frequency domain and vice-versa.

A related term used in this context is spatial frequency, which refers to the (inverse of the) periodicity with which the image intensity values change. Image features with high spatial frequency (such as edges) are those that change greatly in intensity over short image distances.

Drone Controlling using various Remotes:

Using Controller 1:

Drone can be controlled using 1st remote Controller, when it delays for 2 sec the drone control shifts to the another control.



Fig 5.11 Controlling using remote 1

Using 2nd Controller:

When the 1st drone controller is delayed for 2 seconds the master control of drone is shifted to the 2nd controller of the remote.



Fig 5.12 controlling using remote 2

Chapter-6

CONCLUSION AND FUTURE WORK

Conclusion

The course presented in this article is a free educational tool for teaching drone programming in higher education in engineering, particularly suitable for distance learning. It comprises several independent exercises that mimic drones' real-life practical applications, including visual landing, search-and-rescue missions, and road following in real or simulated arrangements.

These exercises focus on

perception, planning-and-control algorithms, emphasizing state-of-the-art topics as computational vision or artificial intelligence. All activities are proposed to the students with a practical "learning by doing" approach.

Self-scheduling or Master-Slave Algorithm

The master process distributes work to slave processes. When a slave finishes, it informs the master, which assigns it a new workload. Slave processes do not communicate with each other. The master process broadcasts vector X to each slave. The master sends one row of the matrix to each slave. The master loops, and gets back one entry of the new vector from each slave. It then sends back new rows of the matrix to the slaves when the slaves are finished, until the matrix is solved. This algorithm is inefficient, due to the extremely large amount of communication required.

Summary

Here the title “SOCCER DRONE” suggests that the drone controlling will move from one hand to another.

With the help of this the drone controllers will achieve their goal.

In these the drone acts like soccer and the drone controllers are players.

With these they will catch the culprit or anything that gone missing is the goal.

Suppose, if the culprit is missing in a particular area these two drone controllers are two sides of that area. So by this they can capture in drone camera and catch the culprit. In drone applications, the drone could send data using telemetry devices or radio frequency module which has a limited range. So, there is no interaction between user and drone after a certain range. In this study, a hierarchical tree topology based wireless drone network is designed and presented to overcome range challenge. Proposed network consist of three main parts; Control Center (CC), Master Drone (MD) and Slave Drones (SDs). The CC as a network manager communicates with just MD via telemetry devices. SDs are explorer drones for the search and rescue application. The data transfer between CC and SDs is provided by MD which is explorer like SDs.

AS there it has many applications, some of the following are as follows:

- Law enforcement and border control surveillance.
- Storm tracking and forecasting hurricanes and tornadoes.
- Precision crop monitoring.
- Arial photography for journalism and filming.
- Law enforcement.

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