

PROJECT - II

Report on

Package Delivery Rover

Submitted in partial fulfillment of the requirements

of the degree of

**Bachelor of Engineering
(Electronics and Telecommunication Engineering)**

by

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Certificate of Approval

This is to certify that, the Mega Project II report entitled

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Declaration

We wish to state that work embodied in this dissertation entitled "**Package Delivery Rover**" has been carried out under the guidance of "Tarlekar Sonali" at Department of Electronics and Telecommunication Engineering, Ramrao Adik Institute of Technology during 2018-2019.

We declare that the work being presented forms my own contribution and has not been submitted for any other Degree or Diploma of any University/Institute. Wherever references have been made to previous works of others, it has been clearly indicated. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

This Project is intended to deliver goods. It uses a GPS sensor integrated with Google Maps or user defined map to deliver from a source to any destination. It uses an ultrasonic distance sensor to map the surrounding to avoid obstacles and find the best route. Also it has versatile Wheels to run on uneven surfaces with a Structure robust enough and powered with Lead Acid batteries. All this system runs through Rasberry Pi and Arduino Hardware with encoder motors to change directions on course. It is apparently intended right now for small premises to deliver but this range can be extended far away. This project can be modified more to suit environment by adding various sensors. It also comprises of Motor Driver Circuit. Finally when the valuables are delivered, the client is prompted for password which is messaged to him to unlock and get hold of his delivery. Delivery being the prime and promising objective, our application of Rover is not limited to it and is highly versatile.

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Chapter 1

Introduction

Bundle conveyance or package conveyance is the conveyance of transportation holders, packages, or high esteem mail as single shipments. The administration is given by most postal frameworks, expedited delivery, private organizations,etc..

Conveyance of stock that square measure noteworthy similar to an article of furniture or huge machines needs exceptional strategy that practically do all the small bundle dispatche. For instance, the arrangement of chain of delivery enormous social unit stock from their creators to all private or business areas through the nation and world is a great deal of cutting edge and conveys with it the following potential for damage and blunder than with littler bundles.

Concentrated yet on truckload shipping transporters handle shipping article of furniture and option noteworthy stock from the maker to a last mile hub. The walk incommodity may typify the test of developing conveyances in urban regions. Conveyances to retail locations, eateries and elective vendors in an exceedingly focal downtown for the most part added to blockage and welfare issues. When the items gain the walk center point that is frequently set however two hundred miles from a definitive conveyance area an over the top walk transporter, conjointly alluded to as a white glove conveyance organization, can deal with a definitive leg of the conveyance.

White glove alludes to the absolute best administration level for walk conveyance of noteworthy stock. It includes the conveyance group conveyance the thing to the region of determination, unloading and gathering it and expelling all bundling and garbage from the client's home. There square measure over four thousand white glove conveyance firms inside us, the greater part of that exclusively perform local conveyances. Some enormous not exactly truckload shipping transporters jointly supply white glove conveyance administration and as of late new companies have risen that supply across the nation systems of white glove conveyance inclusion. With the development of E-business sites that sell noteworthy stock all through the nation and world the white glove conveyance commercial center is moving from to a great extent provincial bearers working with local physical stores to E-trade sites working with national conveyance systems.

Truth be told, the assortment of conveyance alternatives and the apparent nature of the conveyance administration are significant choice criteria for online clients and consequently legitimately sway internet business players accomplishment in the commercial center. Therefore everybody in the coordinations inventory network is striving to give clients the most ideal experience, particularly with regards to improving conveyance times.

People foresee that throughout the following 10 years, independent ground vehicles (AGVs) and package storage spaces will supplant current types of standard bundle



Figure 1.1: Starship Delivery robot(Example)

conveyance and this is principally because of cost favorable circumstances. I read some fascinating examination as of late which recommended that associations could see up to 40 percent decrease in expense over the present customary last-mile conveyance particularly in rustic territories, yet in addition in urban regions, with the presentation of robotized conveyance. As you can see the Starship Robot in Figure 1.1

To stress the size included, a 40 percent sparing in conveyance expenses could convert into a 15 percent to 20 percent point increment in overall revenue, or given that cost is regularly the key choice basis in this market portion, a 15 percent to 20 percent cut in costs. With wages liable to keep on rising, the upside of self-ruling conveyance structures will increment further. Hindrances to computerized conveyance achievement With regards to far reaching selection of robotized conveyance, one noteworthy test dependably exists and that is as to general sentiment on, and acknowledgment of, new advancements. Given that numerous drivers as of now acknowledge a significant level of driver emotionally supportive networks in the present vehicles, running from speed and separation control just as computerized directing as path help, it is difficult to envision that the open will question through and through to self-ruling vehicles.

Besides, numerous huge vehicle and innovation organizations are now putting vigorously in this innovation and they will try to persuade people in general of the advantages of their items and their unrivaled wellbeing specifically.

Chapter 2

Literature Survey

2.1 Drone Delivery

A conveyance ramble is partner degree independent vehicle, ordinarily a UAV, wont to transport bundles, nourishment or elective stock.

Early models of sustenance conveyance rambles grasp the Tacocopter show by Star Simpson, that was a taco conveyance thought using a cell phone application to arrange ramble conveyed tacos in purpose of section space. The disclosure that it didn't exist as a conveyance framework or application semiconductor diode to that being labeled a scam. a similar to thought named the "burrito aircraft" was tried in 2012. that equivalent year, a Free University of Berlin understudy venture inspected the work of automatons for pizza pie conveyance. In 2013, as a piece of partner degree exertion, partner degree independent Domino's kingdom establishment tried the Domicopter. Comparative flights were led in Republic of India and Russia, anyway needed prohibitive endorsement.

An association between 7-Eleven and Flirtey came about inside the underlying FAA-endorsed conveyance to a habitation inside the u. s. in July 2016.[19] the resulting month, the corporate joined forces with Domino's in New Seeland to dispatch the essential business ramble conveyance administration.

In Gregorian logbook month 2016, jalapeno Mexican Grill banded together with Alphabet X and broadcasted it wanted to check ramble conveyances at the Virginia specialized school field. The conveyances were planned to be conveyed in a contained space with the sustenance to be conveyed being made on site.

Associate AI in a very preliminary with Santa Casa head of prosecutor Misericordia Diamond State Penela and Penela government building, made an essential supper conveyance for each anomaly in December 2016. The task means to be substitute to the vehicle completed the small van. The essential recipient to require preferred standpoint of this conveyance administration was Joaquim dos Reis, an old individual living in Podentinhos, who furthermore to dinners conveyed by the automaton, still get the house getting help by the Santa Casa.

Marriott International utilized automatons to convey mixed drinks and beverages to the tables of visitors at various properties in 2017 together with the Marriott Marquis working in Chicago, IL. The structure chain designed an association with DJI in 2016, and utilized the organization's automatons for its indoor beverage conveyance.

The process of researching about the project discovered that there are vehicles which are proposed for bundle conveyance task yet with numerous things lacking which stopped their more extensive adoption. As you can see the Amazon Delivery Drone in figure 2.1



Figure 2.1: Drone Delivery

2.1.1 Advantages

- The path of the drone is quite linear as it flies over land
- Traffic problems are solved as they don't run on roads

2.1.2 Disadvantages

- Drones are quite risky when it comes to delivery as anybody can steal or attack remotely
- The battery of Drone drains quite faster than required as the brushless motors require huge current and rpm
- Also the amount of weight a drone can carry is limited by its overall weight, battery runtime Power, Design, Motors, etc
- Drone fails when flying, due to wind or stability fails are common which has prevented their wider adoption in market.

2.2 StarShip

Self-driving delivery robots are unit touch the streets of London nowadays as a part of the primary major tests of a revolutionary delivery system. Starship Technologies are rolling out its land-based robots within the borough space of London, prior trials in Scotland, Wales and European nation over following six months. The six-wheeled intelligent robots travel at slow speeds on sidewalks to deliver parcels and groceries within the native space. On-demand deliveries may be applied in but half-hour of a booking, with every cargo cost accounting but 1 Starship Technologies provides a completely new assuming to



Figure 2.2: StarShip Rover in Action

native delivery, introducing reasonable, convenient and environmentally friendly ground-based self-driving robots, Allan Martinson, chief in operation officer at ballistic capsule Technologies, tells Newsweek . Starship can modification native deliverya trillion-dollar business that's most likely the most important sector of the worldwide economy nevertheless to be majorly discontinuous by technologies. The firm has not disclosed that retailers and delivery corporations it will be operating with, however Martinson says it's presently in talks with many world corporations, yet as many native businesses. The golem is additionally expected to open up opportunities for brand new business models like machine-controlled rental, come deliveries,etc.. It is hoped that golem delivery systems can ultimately facilitate to cut back native traffic jam and pollution. For those unaware, Starship Technologies was founded by former Skype co-founders Ahti Heinla and Janus Friis in 2014. They build the autonomous robots that people have been constantly talking about delivering pizzas to the consumers. These six-wheeled vehicles are around two feet tall and weigh 40 pounds when empty. They move at normal walking pace and can travel about four miles within an hour.

The company has scored 17.2 million in seed funding led by Mercedes-Benz Vans. This investment accelerates the development of the companys pilot programs in Europe and the US. It has recently also joined hands with food delivery startups DoorDash and Postmates in the US. This means that the food industry is ready to accept tech innovations to automate at least some aspects of their business. Don Meij, Dominos Group CEO and Managing Director states that robot deliveries, currently in beta will complement their existing fleet of cars, scooters, and e-bikes to deliver piping hot pizzas to the customers. And they will become an integral part who will help them complete last-mile deliveries on the regular due to a surge in deliveries and not enough drivers. Meij further continues to add, This technology has the potential to remodel the native delivery of products and groceries. As you can see the StarShip Rover in Figure 2.2

Chapter 3

Structure Design

3.1 Rocker Bogie

The rocker-bogie framework is that the suspension course of action used in the Mars meanderers (mechanical robot) presented for the Mars scout and conjointly utilized on the Mars Exploration Rover (MER) and Mars inquire about lab (MSL) missions. It is by and by NASA's favored style.

The expression "rocker" originates from the shaking side of the bigger links[clarification needed] on the two sides of the suspension. These rockers ar associated with each option and furthermore the vehicle body through a differential. With respect to the suspension, when one rocker goes up, the inverse goes down.

One end of a rocker is fitted with a drive haggle opposite end is rotated to a bogie. Figure 1.1 shows how Rocker Bogie instrument enables wheels to move autonomously making it adaptable.

The expression "bogie" alludes to the connections that have a drive wheel at each end. Intruders were ordinarily utilized as burden wheels in the tracks of armed force tanks as idlers appropriating the heap over the territory. Intruders were likewise regularly utilized on the trailers of semi-trailer trucks. The two applications currently lean toward trailing arm suspensions.

3.2 Design

The rocker-bogie style has no springs or stub axles for each wheel, allowing the meanderer to move over obstructions, similar to rocks, that square measure up to twofold the wheel's distance across in size though keeping every one of the six wheels on the base. like any mechanical framework, the lean solidness is prohibited by the pinnacle of the center of gravity. Frameworks misuse springs will in general tip a great deal of basically on the grounds that the stacked feature yields. bolstered the center of mass, the Curiosity wanderer of the Mars look into research center mission will look up to a tilt of at least forty five degrees toward any path while not upsetting, anyway programmed sensors limit the meanderer from massive 30-degree tilts. The framework is expected to be utilized at moderate speed of around ten centimeters for every second (3.9 in/s) along these lines on limit dynamic stuns and of import damage to the vehicle once surmounting sizable snags. Figure 3.1 shows Rocker Bogie Mechanism.

JPL (Jet Propulsion Laboratory) expresses that this rocker bogie framework lessens

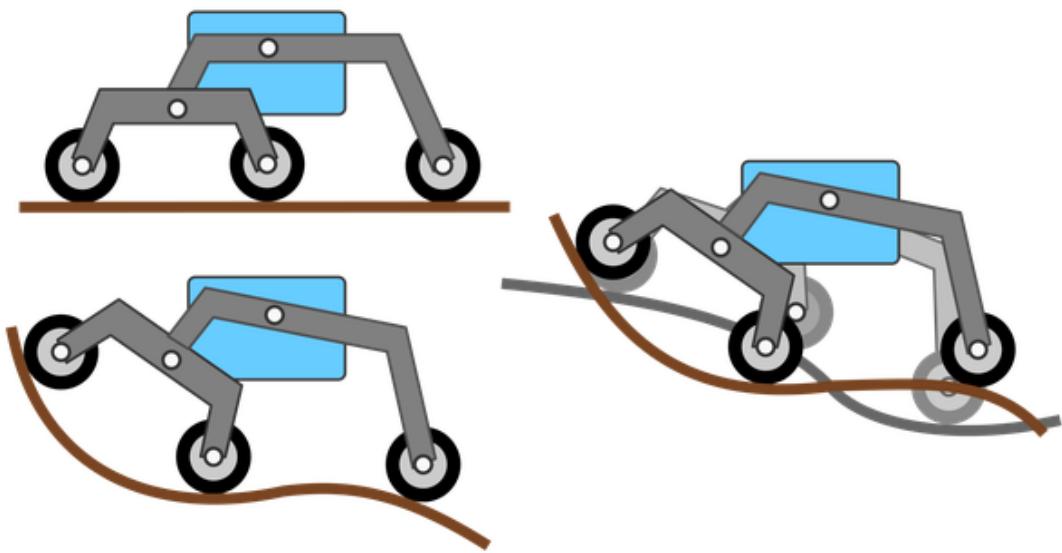


Figure 3.1: Rocker Bogie

the movement of the most MER(Mars Exploration Rover) vehicle body by 0.5 contrasted with elective suspension frameworks. everything about meanderer's six wheels has AN independent engine. 2—the 2 front and two back wheels have singular directing engines which grant the vehicle to appear in situ. each wheel conjointly has spikes, giving hold to mounting in delicate sand and scrambling over rocks. the most speed of the robots worked amid this implies is banished to dispense with as a few unique impacts as feasible all together that the engines is twofold outfitted down, hence facultative each wheel to independently convey a larger than usual part of the total vehicle's mass.

So as to go over a vertical impediment face, the front wheels square measure constrained against the hindrance by the center and back wheels. The turn of the front wheel at that point lifts the front of the vehicle up and over the snag. the inside wheel is then pressed against the hindrance by the back haggles against the snag by the front till it's raised up and over. At long last, the back wheel is compel over the obstruction by the front 2 wheels. all through each wheel's traversal of the hindrance, forward advancement of the vehicle is hindered or completely ended. this is regularly not a trouble for the operational velocities at that these vehicles are worked hitherto. Figure 3.2 shows Rocker Bogie Mechanism in action.

In Simple Words,

- Rocker Bogie Suspension has the specialty of being able to climb over obstacles twice the diameter of wheel that without compromising the stability of the rover as a whole.
- The two sides i.e.left and right move independently and hence the rover can traverse terrains where the right and left rockers go over different type of obstacles.
- The mechanism allows to climb over high obstacles while keeping all the six wheels in contact with the ground. This is true oniy at the operational speed of rovers like Curiosity which is around 10 cm/s.

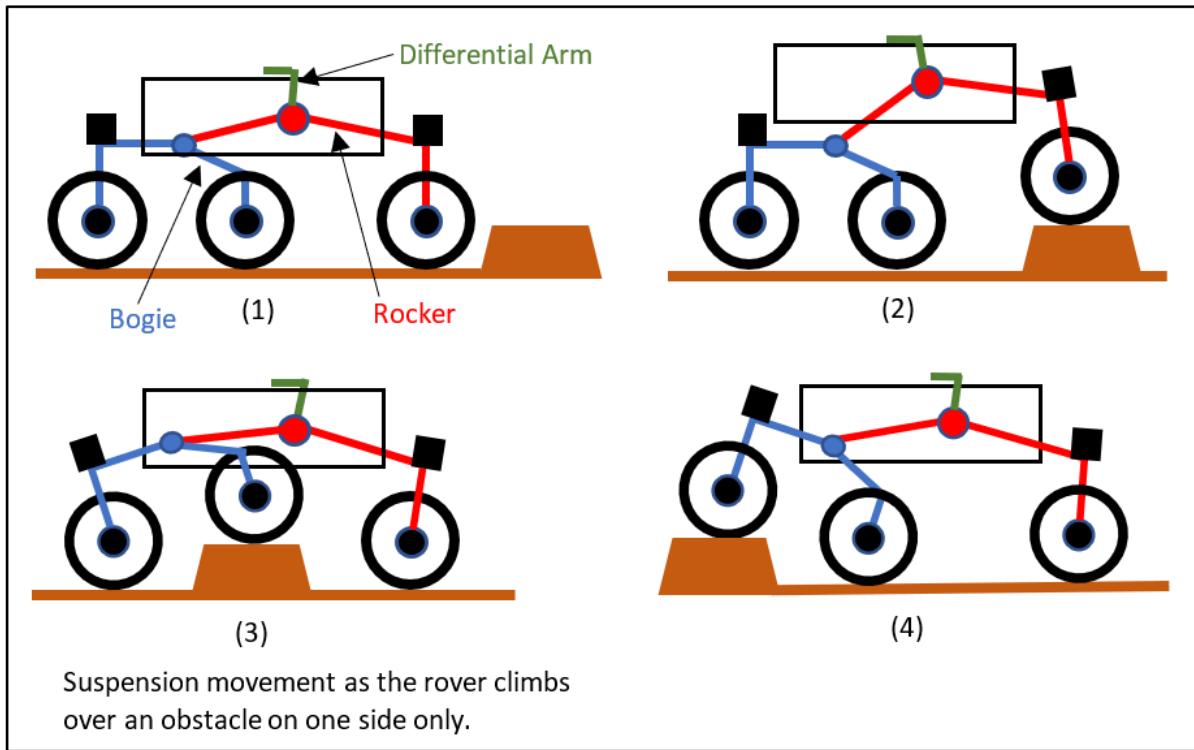


Figure 3.2: Rocker Bogie climbs over barriers

- The mechanism is designed such that due to the independent motion of right and left rockers the pitching of the chassis or the rover body remains an average of the two rockers.
- System with spring suspensions are susceptible to tip-over sideways easily than the rocker-bogie. Curiosity, by design, can sustain over 50 deg tilt in any direction.
- The design incorporates independent motors for each wheel. There are no springs or axles making the design more simpler and more reliable. The front and back wheels have independent motors for steering, enabling the rover to turn on the spot without skidding.
- The design reduces the main body motion by half comparing to any other suspension. The jerk experienced by any of the wheel is transferred to the body as a rotation via the differential connecting the two rockers not as translation like conventional suspensions.

Chapter 4

Block Diagram

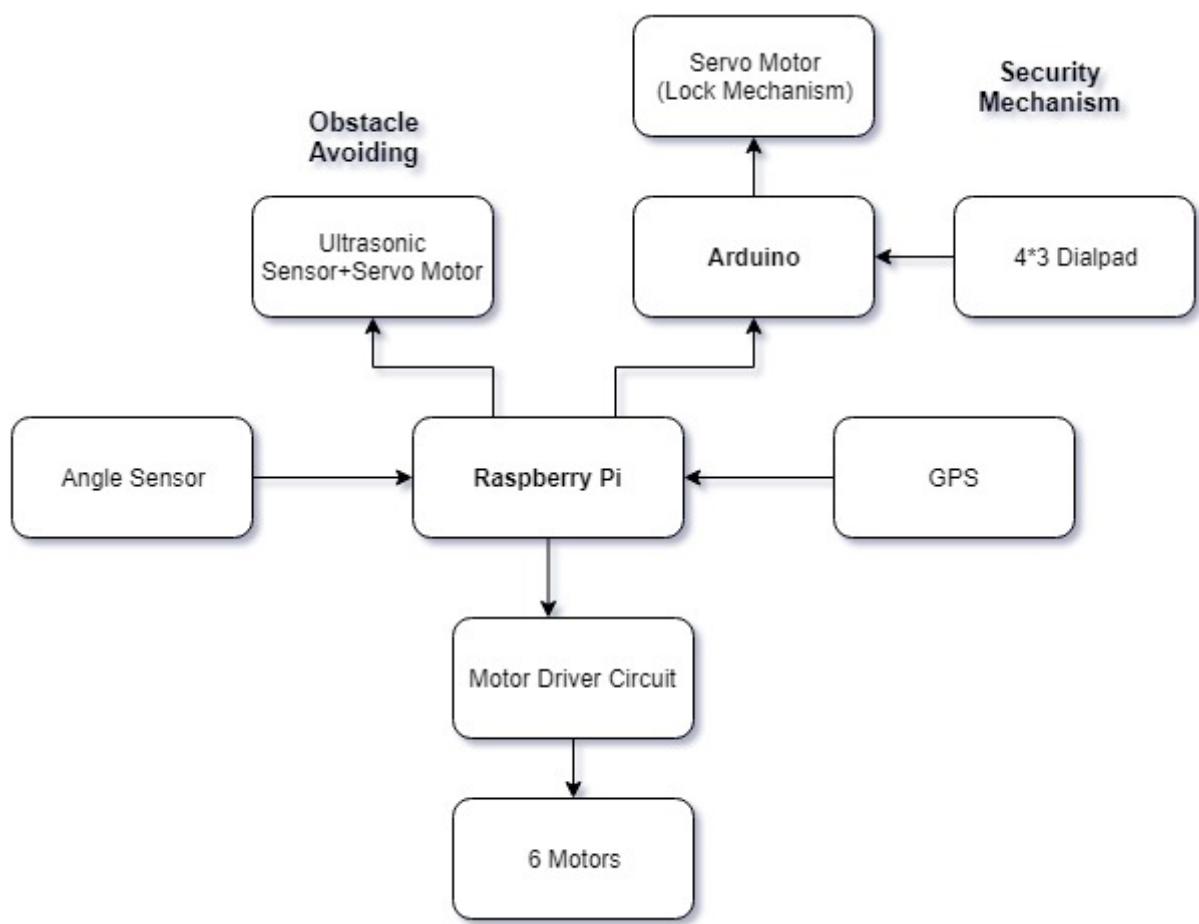


Figure 4.1: Block Diagram

Figure 4.1 shows a simple Block Diagram of the Whole Project.

4.1 Working

- Figure 2.1 shows the Block Diagram.Raspberry Pie is used as the medium to communicate and control all the devices connected.
- Motor driver is used to control and power the DC motor sand their speed.
- GPS is used to find the Current location and according to that navigate the rover to the Destination.
- Inbuilt Wifi Module is used to integrate Google Maps or User Defined Map with GPS Coordinates for the user to define Source and Destination.
- Raspberry Pie controls the Raspberry Pie for Security Mechanism.

Chapter 5

System Design

5.1 GPS

- GPS is a system that provides geo-location and time information to GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.
- Obstacles such as mountains and buildings block the relatively weak GPS signals.
- The GPS does not require the user to transmit any data and it operates independently of any telephonic or internet reception though these technologies can enhance the usefulness of the GPS positioning information.
- The GPS provides critical positioning capabilities to civil,military and commercial users around the world,etc..
- GPS receivers use a constellation of satellites and ground stations to compute position and time almost anywhere on the earth.

5.2 Obstacle Avoidance

- Obstacle avoidance is the task of satisfying some control objective subject to non-intersection or non-collision position constraints.
- Ultrasonic Sensors HC SR04 is a good choice for the course.
- It measures the distance of target objects or materials through the air using non-contact technology. i.e. without damage and are easy to use and reliable.
- Thus larger obstacles can be avoided and smaller obstacles can be traversed upon

5.3 Security

- The package is secured within a case made using a combination turnable magnets and a servo motor.
- This case is protected using a pin code which is sent to the clients Cell Phone

- This security code is required to be typed into the dialpad of the case to unlock and access the package.

5.4 Map

- Google Maps can be used to pick up a Source and Destination.
- If required User Defined Map can be feeded into to set Source/Destination.
- User-Defined Map is an image cropped of Campus and divided into rows and columns with each element having a range of latitude and longitude.
- Each element of the image in which the traversable paths(roads) lie, will be marked a distinct color and the remaining grid, which is non traversable will be another color.
- This technique will help the Rover to understand its current location and follow the destination through the shortest path possible.
- Google Maps Direction API makes it possible to find the path required in JSON form.
- Arduino again controls the Dialpad and Servo Motor for lock mechanism.
- Angle Sensor has inbuilt Accelerometer, Gyrosesnsor and Magnetometer.
- Servo Motor + Ultrasonic sensors are used for Obstacle Avoiding.

Figure 5.1 shows a Simple Circuit Diagram.

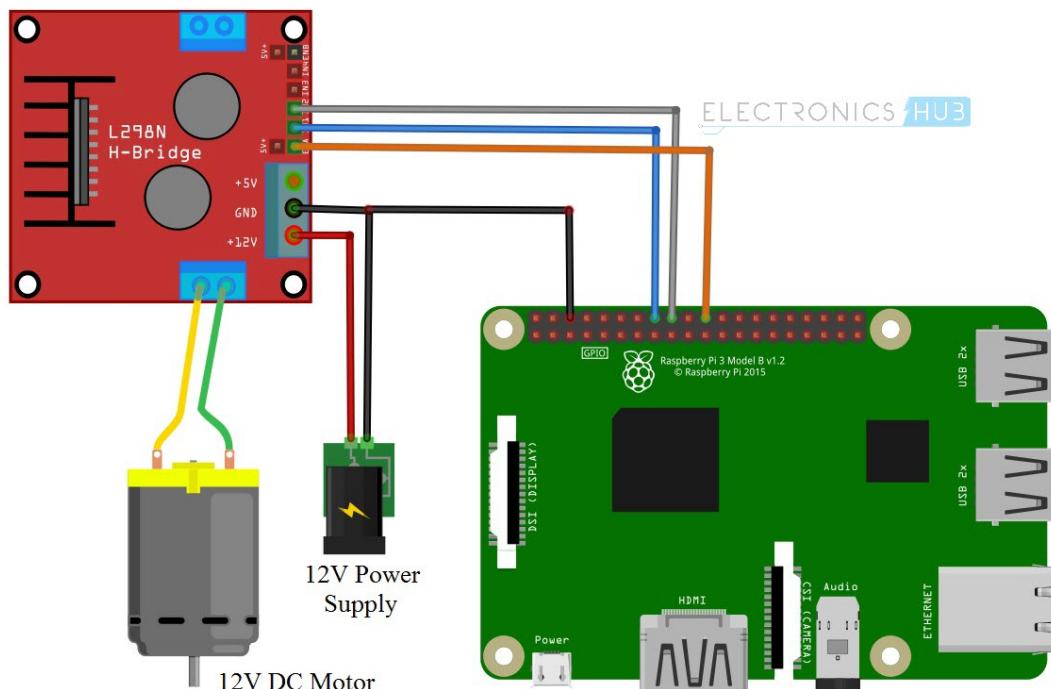


Figure 5.1: Circuit Diagram

Chapter 6

Maps

6.1 Api

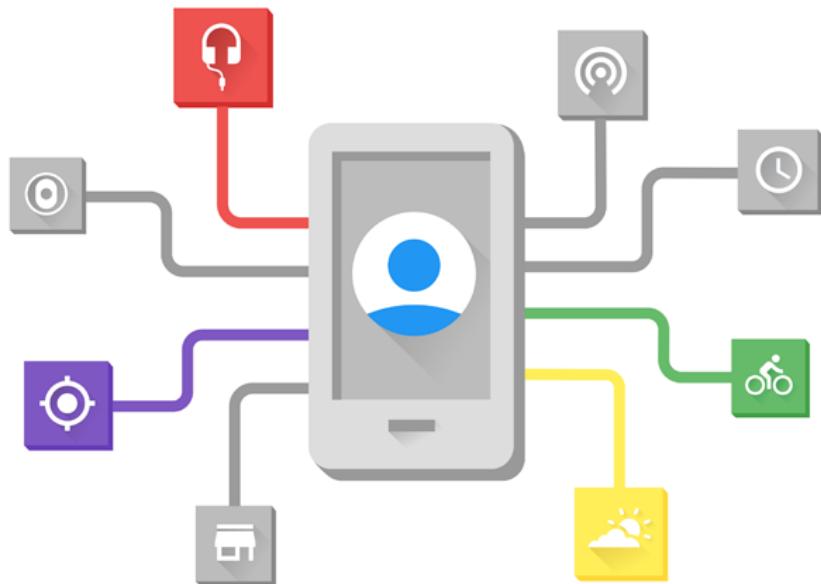


Figure 6.1: Api

In PC programming, an application programming interface (API) is a lot of correspondence conventions, apparatuses for structure programming and subroutine definitions. By and large terms, it is a lot of plainly characterized techniques for correspondence among different parts. A decent API makes it simpler to build up a PC program by giving all the structure squares which are then assembled by the software engineer. Figure 6.1 shows a Simple Api demonstration.

An API might be for an working framework, PC equipment, online framework, database framework, programming library,etc.. An API determination can take numerous structures, however frequently incorporates details for schedules, information structures,

object classes, factors, or remote calls. POSIX, Windows API and ASPI are instances of various types of APIs. Documentation for the API as a rule is given to encourage use and execution.

An API at times is elucidated to a PC code library. The API depicts Associate in Nursingd endorses the "normal conduct" (a determination) while the library is a "genuine execution" of this arrangement of principles.

A solitary API will have numerous executions (or none, being dynamic) inside the style of very surprising libraries that share a comparable programming interface.

The detachment of the API from its execution will allow programs written in one language to utilize a library written in another. for example, because of Scala and Java incorporate to perfect bytecode, Scala engineers will trade out of any Java API.

Programming interface use will differ figuring on the kind of programing language concerned. Partner in Nursing API for a procedural language like Lua may comprise fundamentally of essential schedules to execute code, control data or handle mistakes while Associate in Nursing API for Associate in Nursing object-arranged language, similar to Java, would supply a detail of classes and its classification ways.

Language ties additionally are class Apis. By mapping the choices Associate in Nursingd abilities of 1 language to an interface authorized in another dialect, a language restricting grants a library or administration written in one language to be utilized once creating in another dialect. Apparatuses like SWIG and F2PY, a Fortran-to-Python interface generator, encourage the making of such interfaces.

An API may likewise be related with a PC code structure: a system might be bolstered numerous libraries actualizing numerous variety Apis, dislike the ordinary utilization of Associate in Nursing API, the entrance to the conduct planned into the structure is intervene by expanding its substance with new classes impeded into the structure itself.

In addition, the general program stream of the board might be out of the administration of the guest and inside the hands of the system by reversal of the executives or a similar instrument.

Operating Systems : An API will determine the interface between partner degree application and furthermore the software. POSIX, for instance, indicates a gathering of basic Apis that intend to change partner degree application composed for a POSIX conformant programming to be accumulated for one more POSIX conformant programming.

Linux and Berkeley PC code Distribution zone unit tests of in task frameworks that execute the POSIX Apis.

Microsoft has appeared incredible pledge to a retrogressive good API, fundamentally among its Windows API (Win32) library, accordingly more established applications could keep running on more up to date forms of Windows abuse partner degree executable-explicit setting known as "Similarity Mode".

An API contrasts from partner degree application parallel interface (ABI) in this partner degree API is ASCII content record principally based while partner degree ABI is double based. for instance, POSIX gives Apis though the UNIX working framework ordinary Base gives partner degree ABI.

Remote APIs : Remote family Apis empower engineers to control remote assets through conventions, explicit guidelines for correspondence that empower totally extraordinary advances to figure along, in spite of language or stage. for example, the Java information property API licenses engineers to address numerous different assortments of databases

with an equal arrangement of capacities, though the Java remote procedure conjuring API utilizes the Java Remote strategy Protocol to allow summon of capacities that work remotely, anyway appear to be local to the designer. Along these lines, remote class Apis region unit accommodating in keeping up the thing reflection in article arranged programming; a way choice, dead locally on an intermediary object, summons the relating strategy on the remote item, abuse the remoting convention, and obtains the outcome to be utilized locally as come worth. A change on the intermediary object moreover can prompt a relating adjustment on the remote article.

Web APIs : Main article: Web API Web arthropod class square measure the sketched out interfaces through that communications occur between Associate in Nursing venture and applications that utilization its benefits, that is likewise a Service Level Agreement (SLA) to indicate the intentional provider and uncover the administration way or general asset locator for its API clients. Partner in Nursing API approach is Associate in Nursing part of information approach that rotates around giving a program interface to an accumulation of administrations to entirely unexpected applications serving varying sorts of customers.

At the point when utilized with regards to web advancement, Associate in Nursing API is generally sketched out as an accumulation of determinations, similar to machine-intelligible content Transfer Protocol (HTTP) demand messages, next to a meaning of the structure of reaction messages, now and again in Associate in Nursing protrusible wording (XML) or JavaScript Object Notation (JSON) group. Partner in Nursing precedent likely could be an organization API which will be superimposed to Associate in Nursing eCommerce-centered site to encourage requesting shipping administrations and precisely exemplify current transportation rates, while not the area engineer entering the shipper's rate table into a web information. though "web API" customarily pretty much has been substitutable for network access, the ongoing pattern (purported web two.0) has been moving expelled from clear Object Access Protocol (SOAP) principally based web administrations and administration arranged structure (SOA) towards a ton of direct depictive state exchange (REST) vogue web assets and asset situated plan (ROA). a piece of this pattern is clarified to the etymology web development toward Resource Description Framework (RDF), an idea to push electronic power building innovations. web arthropod family empower the blend of different arthropod class into new applications alluded to as mashups. inside the web based life zone, web arthropod class have enabled web networks to encourage sharing substance and data among networks and applications. amid this implies, content that is made in one spot powerfully might be declare and refreshed to numerous areas on the net. for instance, Twitter's REST API licenses designers to get to center Twitter data and furthermore the Search API gives procedures to engineers to move with Twitter Search and patterns data.

6.2 Google Maps

Google Maps could be a net mapping administration created by Google. It offers satellite creative ability, airborne photography, road maps, 360 bird's-eye perspectives on avenues (Street View), timeframe traffic conditions, and course planning for going by foot, vehicle, bike and air (in beta), or open transportation. Figure 6.1 shows the working of an API.

Google Maps started as a C++ work area program at wherever two Technologies.

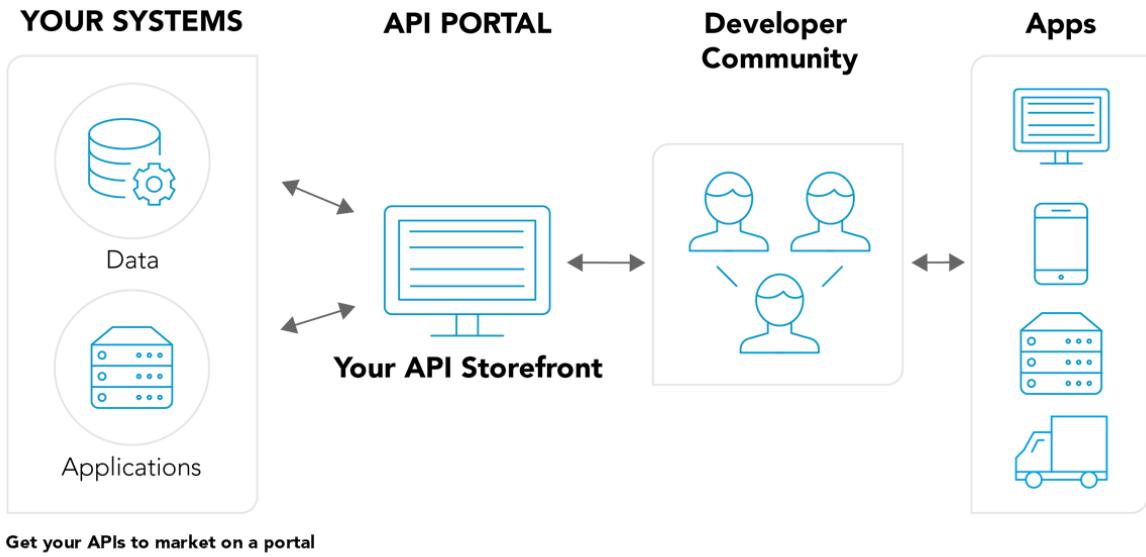


Figure 6.2: Working

In Oct 2004, the corporate was noninheritable by Google, that recover it into an online application. at the point when further acquisitions of a geospatial information picture organization and a realtime traffic instrument, Google Maps was propelled in Gregorian timetable month 2005. The administration's forepart uses JavaScript, XML, and Ajax. Google Maps offers partner degree API that empowers maps to be implanted on outsider websites,[2] and offers a locator for organizations and diverse associations in different nations round the world. Google cartographer enabled clients to cooperatively grow and refresh the administration's mapping worldwide anyway was no longer in production from March 2017. In any case, publicly supported commitments to Google Maps weren't no longer available on the grounds that the organization broadcasted those alternatives are exchanged to the Google local Guides program.

Google Maps' satellite read could be a "top-down" or "feathered creatures eye" see; a large portion of the high-goals creative ability of urban communities is aeronautical photography taken from art flying at 800 to one,500 feet (240 to 460 m), though most unique creative ability is from satellites. a ton of the realistic satellite creative ability isn't any very 3 years later and is refreshed every day. Google Maps utilized a variation of the Mercator's projection, thus can't precisely demonstrate zones round the posts. In any case, in August 2018, the work area variant of Google Maps was refreshed to show a 3D globe.

Google Maps for golem and iOS gadgets was free in Sept 2008 and alternatives GPS turn-by-turn route related to committed stopping help choices. In August 2013, it had been resolved to be the world's most all around loved application for cell phones, with more than fifty four percent of overall cell phone property holders abuse it at least once.

In 2012, Google concurring having over seven,100 staff and temporary workers straightforwardly working in mapping. Figure 6.3 shows the logo of Google Maps.



Figure 6.3: Google Maps

6.3 Google Maps APIs

What is a web mapping API?

An API (application programming interface) could be a system that you simply will use to record a program. It gives a gathering of classes and capacities that help you abstain from composing all the low-level code to perform explicit activities. for example, web mapping family Apis for the most part grasp classifications for maps AND layers so you don't have to compose all the low-level code for showing an intelligent guide picture and drawing a substitution layer subsequently. Rather, you'll basically create a substitution map object, produce a substitution layer article, and choice some system like `layer.addTo(map)`. The API abstracts the multifaceted nature of the undertaking and makes it clear for you to focus on the mapping parts of your application, rather than dispensing time on the low-level supply.

You've most likely identified of universally useful variety Apis like Java and furthermore the Microsoft .NET Framework that might be wont to compose a wide range of projects on work area, web, and versatile stages. There are a great deal of specific class Apis planned around beyond any doubt stock and functionalities. for example, you'll have distinguished of Google App Engine, Amazon web Services, and Microsoft Windows Azure that ar intended for restrictive distributed computing situations.

APIs structured explicitly for the point of making web maps grasp OpenLayers, Leaflet, the Google Maps API, and furthermore the ArcGIS API for JavaScript. The last 2 ar even a great deal of explicit in this they're planned around explicit restrictive stages. This exercise presents some of the different class Apis and application improvement approaches, at that point dives into detail while in transit to utilize the Leaflet API.

Know that AN API isn't a programming language; rather, it's an accumulation of structure obstructs that you simply conjure utilizing a language. A few family Apis are bolstered to be utilized with various programming dialects and distinctive class Apis ar fixing to 1 explicit language. for example, there's each a language AND an API named Java. The Java language is utilized to figure with the Java API (and diverse APIs). In qualification, the .NET Framework is only AN API there's no language known as .NET.



Figure 6.4: Google Maps Api

Applications abuse the .NET Framework are for the most part customized misuse the C Sharp or Visual Basic dialects.

Google Maps Api

The Google Maps API gives designers the opportunity to overlay their own insight on high of secured map layers from Google Maps. The overlaid learning is normally given through KML documents, and is shown as intelligent vector illustrations drawn on the customer feature. These designs will be restyled by the engineer to utilize custom marker images, and might be supreme to popups or tables to show further information on a sadness. Figure 6.4 shows the Google Maps API framework.

Maybe the biggest preferred standpoint of the Google Maps API is that it brings the structure Associate in Nursingd feel of Google Maps to an application. a few net clients have aptitude with Google Maps and will feel gentler after they see the Google Maps route the executives or guide vogue, even once this can be implanted in Associate in Nursing remote outsider application. The Google Maps API is apparently no a great deal of solid or simpler to use than some of the FOSS family Apis spoke to above; at the same time, it's completely recorded and offers an outsized designer network.

In July 2018, Google Maps is embracing a compensation as-you-go show whereby all clients get two hundred dollar/month of credit and should pay expenses for administration use on the far side this amount. underneath their rating organize at the season of this composition, that may be sufficient to conceal one hundred,000 static guide perspectives or twenty eight,500 unique guide sees. See this page for the chief forward-thinking information on Google's evaluating and Plans.

6.4 Direction Apis

The Directions API is an administration that ascertains bearings between areas. You can look for bearings for a few methods of transportation, including travel, driving, strolling, or cycling.

You get to the Directions API through a HTTP interface, with solicitations built as a

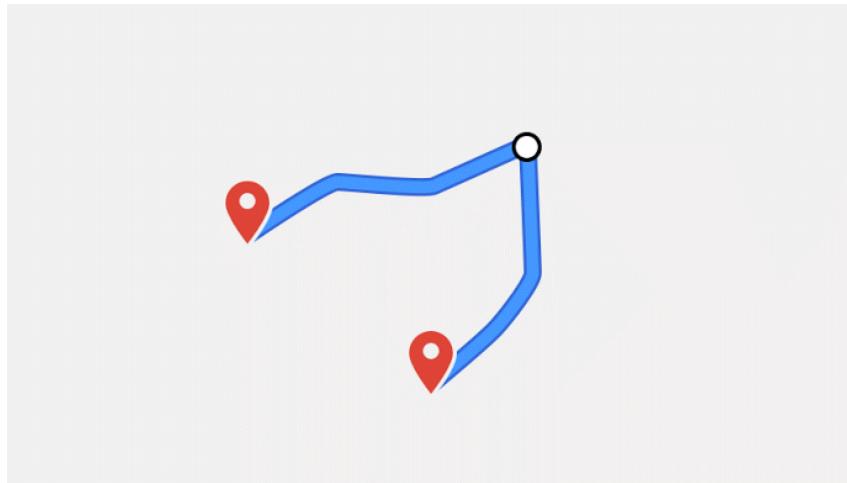


Figure 6.5: Simple Route

URL string, utilizing content strings or scope/longitude directions to recognize the areas, alongside your API key. Figure 6.5 shows a Simple Route/Path. The Directions API is an administration that computes headings between areas utilizing a HTTP demand. This video delineates the utilization of the Directions API to help individuals discover their direction. The video incorporates exhortation on proxying the web administration by means of your server when you're utilizing the API in a portable application, to secure your API key. With the Directions API, you can: Look for bearings for a few methods of transportation. Return multi-part bearings utilizing a progression of waypoints. Determine starting points, goals, and waypoints as content strings. The API restores the most effective courses while ascertaining headings. Travel time is the essential factor upgraded, yet the API may likewise consider different factors, for example, separate, number of turns and a lot more when choosing which course is the most effective.

A Directions API request takes the following form:

<https://maps.googleapis.com/maps/api/directions/outputFormat?parameters>

where output Format may be either of the following values: json (recommended) indicates output in JavaScript Object Notation (JSON) or xml indicates output as XML. Figure 6.6 shows a map made by using Direction API.

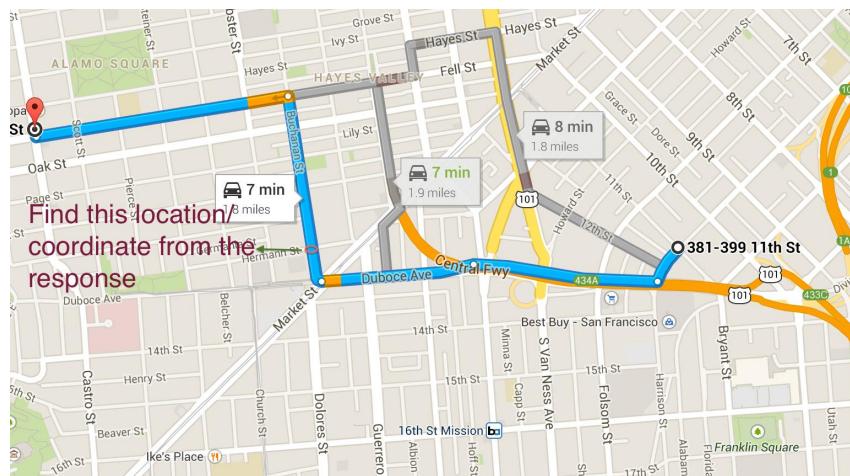


Figure 6.6: Direction Api

Chapter 7

Security Mechanism

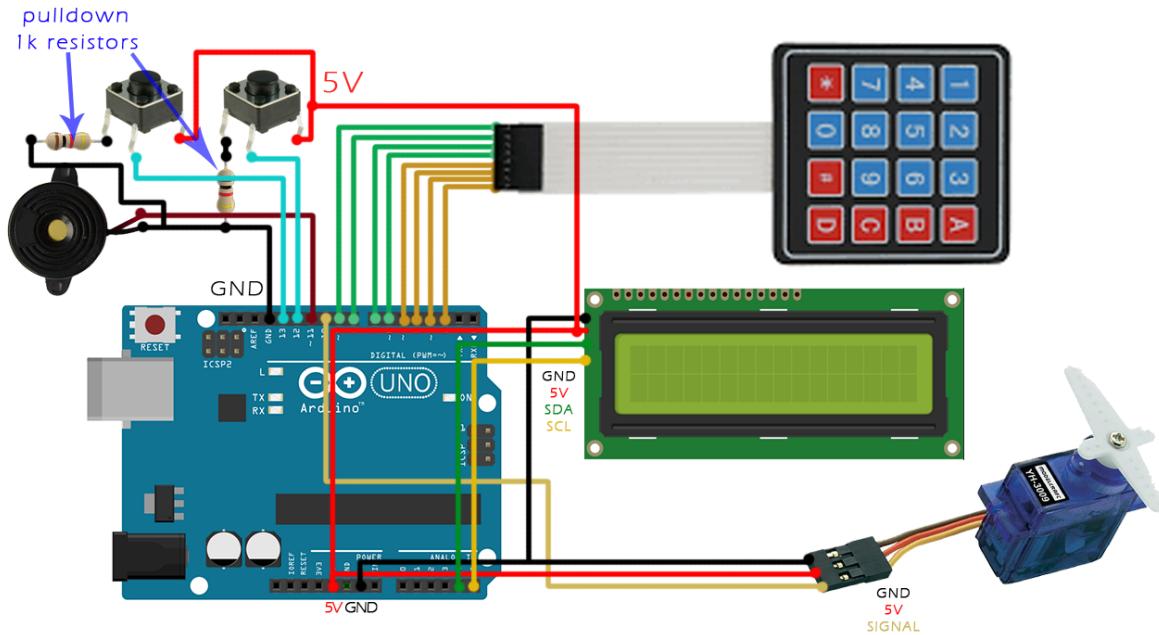


Figure 7.1: Security Circuit Diagram

7.1 Idea

The plan is to keep only the client authorised to access the package. This involves sending mail to client and OTP Generation, Lock Mechanism, etc. Figure 7.1 shows a Simple circuit diagram of Decurity Mechanism.

7.2 SMTP Server

SMTP is A structure that means "basic mail exchange convention". inside the least difficult feasible terms, A SMTP server could be a server or grouping of servers whose sole reason for existing is to send and get messages inside the kind of messages. From a specialized stance, A SMTP server is built like the other server it's the perform of

A SMTP server that separates it. SMTP servers will have their very own committed location or set of addresses that might be dictated by the shopper exploitation the server. A SMTP server is that the machine that deals with the full email conveyance process: that is the reason to send your messages with AN email customer or programming framework you wish starting of all to tack together the privilege SMTP settings most importantly, the right SMTP address you're exploitation. (For example, Gmail's is smtp.gmail.com). This SMTP server goes about as a Message office (MTA) and is given to your mail purchaser once you set it up. The mail shopper and furthermore the SMTP server transfer information concerning your email forward and backward, with the SMTP server checking the transmission learning of the email like its sender, its beneficiary, the spaces of each, etc. In any case, the SMTP server doesn't check the body substance of the email.

On the off chance that the beneficiary of your email has A record wherever the area is straightforwardly associated with the SMTP server then the email is conveyed rapidly. In the event that they are doing not have A record wherever the area is straightforwardly associated with the SMTP server then the SMTP server transfers the message to AN approaching server that is closer to the beneficiary. This strategy proceeds till the message is conveyed to a server that is associated on to the beneficiary's space, at that reason the email is conveyed.

On the off chance that the beneficiary's server is down or occupied, at that point the SMTP server just stores the message in an exceedingly reinforcement server. In the event that no reinforcement server is offered, at that point the message is lined and furthermore the SMTP server can choose to redeliver it sporadically till an effective conveyance is cultivated. when a specific assortment of ineffective conveyance attempts, however, the message is returned to the sender and furthermore the sender is informed that it completely was not with progress conveyed. Figure 7.2 shows a SMTP sever.

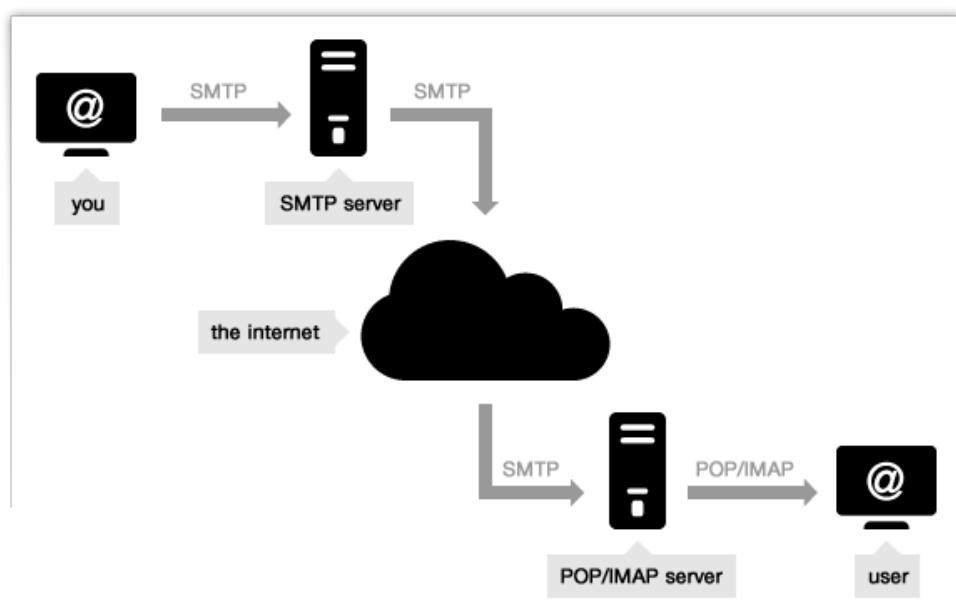


Figure 7.2: SMTP

7.3 Serial Communication

In this project, the project is fulfilled by creating a communication between Arduino and Raspberry Pi that transfer important info by causing information one bit at a time. Serial communications are essential for each Micro-controllers to speak between Micro-controllers and another device. The Micro-controller sends these one and zero (bits) that contain necessary info one by one, or Serially. These bits kind along and switch into bytes (composed of eight bits). Figure 7.3 shows a Simple Raspberry Pi-Arduino Communication.

RaspPi-Arduino Serial Communication

01001000 01110101 00011101 11100010 10101011 01010100

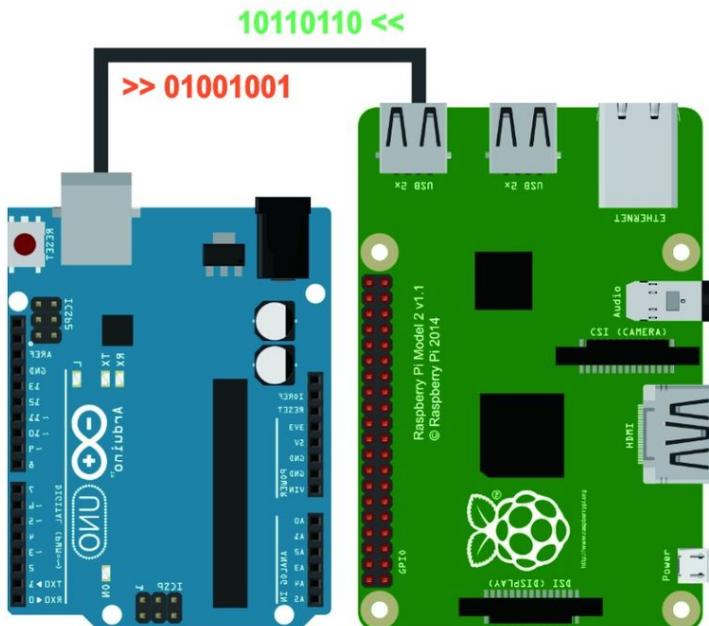


Figure 7.3: Serial Communication between both

7.4 Working

Security Mechanism was built using a Plastic box .The project used an aluminum lock attached to a servo motor which moves in only 0 to 180 degrees. It also has LCD display and 3*4 keypad. All this components are attached to an Arduino. This Arduino is dedicated for the whole security thing inside the box powered by a battery. It receives a signal including the pincode from Raspberry Pi upon reaching the destination. The Raspberry Pi sends an email to the client on reaching the destination the pincode.

Chapter 8

Components

8.1 Arduino

Arduino is partner degree open supply component and programming bundle organization, venture, and client network that styles and produces single-board microcontrollers and microcontroller packs for structure computerized gadgets and intuitive articles that may detect and the executives protests inside the physical world. The comes stock zone unit conveyed as ASCII content record equipment what's more, programming bundle, that region unit authorized underneath the wildebeest Lesser General Public License (LGPL) or on the other hand the wildebeest General Public License (GPL), permitting the production of Arduino sheets and programming bundle conveyance by anybody. Arduino sheets region unit out there monetarily in preassembled kind, or as custom made units. Arduino board styles utilize a scope of chip and controllers. The sheets zone unit furnished with sets of advanced and simple input/yield (I/O) sticks that will be between Janus-looked to fluctuated augmentation sheets (shields) what's more, elective circuits. The sheets include sequential correspondences interfaces, together with Uni-versal Serial Bus (USB) on certain models, that additionally are utilized for stacking programs from PCs. The microcontrollers territory unit for the most part modified utilizing a saying of highlights from the programming dialects C and C++. moreover to exploitation old compiler toolchains, the Arduino venture gives partner coordinated improvement environment (IDE) upheld the procedure language venture. The Arduino Uno contrasts from all pre- surrendering sheets in that it doesn't utilize the FTDI USB-to-sequential driver chip. Rather, it highlights the Atmega8U2 microcontroller chip modified as a USB-to-sequential converter. Uno implies one in Italian and is named to stamp the up and coming arrival of Arduino 1.0. The Arduino Uno and rendition 1.0 will be the reference forms of Arduino, pushing ahead. The Uno is the most recent in a progression of USB Arduino sheets, and the reference display for the Arduino platformArduino is a simple USB interface. This permits interface with USB as this resembles a sequential device. The chip on the board connects directly to your USB port and supports on your PC as a virtual sequential port. The advantage of this setup is that sequential correspondence is an very simple convention which is dependable and USB makes association with present day PCs and makes it agreeable. It is anything but difficult to-discover the microcontroller mind which is the ATmega328 chip. It has increasingly number of equipment highlights like clocks, outer furthermore, inside interferes with, PWM pins and numerous rest modes. It is an open source structure what's more, there is leeway of being open source is that it has a huge network of individuals utilizing and investigating it. Figure 8.1 shows an Arduino. This makes it simple to



Figure 8.1: Arduino

help in investigating ventures. It is a 16 MHz clock which is quick enough for most applications and does not accelerates the microcontroller. It is exceptionally helpful to oversee control inside it and it had an element of worked in voltage guideline. This can likewise be fueled straightforwardly on a USB port with no outside power. You can associate an outer power wellspring of upto 12v and this manages it to both 5v and 3.3v. 13 computerized pins and 6 simple pins. This kind of pins enables you to interface equipment to your Arduino Uno board remotely. These pins are utilized as a key for expanding the figuring capacity of the Arduino Uno into this present reality. Just attachment your electronic gadgets and sensors into the attachments that compare to every one of these pins what's more, you are a great idea to go. This has ICSP connector for bypassing the USB port and interfacing the Arduino supportable as a sequential gadget. This port is important to re-bootload your chip on the off chance that it ruins and can never again used to your PC. It has a 32 KB of streak memory for putting away your code. An on-board LED is joined to computerized stick 13 to make quick the investigating of code and to make the troubleshoot procedure simple. At last, it has a catch to reset the program on the chip.

8.2 Raspberry Pie

The Raspberry Pi could be a low esteem, Visa estimated pc that connects to a pc screen or TV, and utilizations a standard console and mouse. it's a competent next to no gadget that enables people of any age to investigate figuring, and to discover an approach to program in dialects like Scratch and Python. It can do all that you'd anticipate that a PC should attempt to, from perusing the net and partaking in top quality video, to making spreadsheets, word-preparing, and participating in recreations. What's extra, the Raspberry Pi has the ability to move with the surface world, and has been utilized in a decent exhibit of computerized creator comes, from music machines and parent locators to climate stations and tweeting dove-cotes with infra-red cameras. Projects might want to

imagine the Raspberry Pi being utilized by youngsters wherever the planet to discover to program and see anyway PCs work. The Raspberry Pi could be a progression of modest single-board PCs created inside the uk by the Raspberry Pi Foundation to push instructing of essential designing in resources and in creating countries. The unique model turned out to be much more broad than anticipated, selling outside its objective commercial center for utilizations like AI. It doesn't grasp peripherals, (for example, consoles and mice) and cases. Be that as it may, a few frill are encased in numerous official and informal packs. The Raspberry Pi propelled in 2012, and there have been a few emphases and varieties discharged from that point forward. The first Pi had a solitary center 700MHz CPU and simply 256MB RAM, and the most recent model has a quad-center 1.4GHz CPU with 1GB RAM. The fundamental value point for Raspberry Pi has dependably been 35 dollars and the sum total of what models have been 35 or less, including the Pi Zero, which costs only 5. Everywhere throughout the world, individuals use Raspberry Pis to pick up programming abilities, assemble equipment ventures, do home mechanization, and even use them in modern applications. The Raspberry Pi is a modest PC that runs Linux, yet it likewise gives a lot of GPIO (universally useful information/yield) sticks that enable you to control electronic parts for physical figuring and investigate the Internet of Things (IoT). The Broadcom BCM2835 SoC utilized in the original Raspberry Pi incorporates a 700 MHz ARM11 76JZF-S processor, VideoCore IV designs preparing unit (GPU), and RAM. It has a dimension 1 (L1) store of 16 KB and a dimension 2 (L2) reserve of 128 KB. The dimension 2 reserve is utilized principally by the GPU. The SoC is stacked underneath the RAM chip, so just its edge is unmistakable. The 1176JZ(F)- S is a similar CPU utilized in the first iPhone, in spite of the fact that at a higher clock rate, and mated with an a lot quicker GPU. The prior V1.1 model of the Raspberry Pi 2 utilized a Broadcom BCM2836 SoC with a 900 MHz 32-bit, quad-center ARM Cortex-A7 processor, with 256 KB shared L2 store. The Raspberry Pi 2 V1.2 was moved up to a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-center ARM Cortex-A53 processor, the equivalent SoC which is utilized on the Raspberry Pi 3, yet underclocked (as a matter of course) to the equivalent 900 MHz CPU clock speed as the V1.1. The BCM2836 SoC is no longer underway starting late 2016. The Raspberry Pi 3+ utilizes a Broadcom BCM2837B0 SoC with a 1.4 GHz 64-bit quad-center ARM Cortex-A53 processor, with 512 KB shared L2 cache. The Raspberry Pi works in the open source biological community: it runs Linux (an assortment of dispersions), and its fundamental bolstered working framework, Raspbian, is open source and runs a suite of open source programming. The Raspberry Pi Foundation adds to the Linux bit and different other open source extends just as discharging quite its very own bit programming as open source. What would you be able to do with a Raspberry Pi? A few people purchase a Raspberry Pi to figure out how to code, and individuals who would already be able to code utilize the Pi to figure out how to code gadgets for physical ventures. The Raspberry Pi can open doors for you to make your own home computerization ventures, which is well known among individuals in the open source network since it places you in charge, as opposed to utilizing a restrictive shut framework. Figure 8.2 shows a Raspberry Pie.

Features of Raspberry PI Model B

- 1024 MB SDRAM memory
- Broadcom BCM2835 SoC full high definition multimedia processor
- Dual Core Video Core IV Multimedia coprocessor



Figure 8.2: Raspberry Pie

- Single 2.0 USB connector
- HDMI (rev 1.3 and 1.4) Composite RCA (PAL and NTSC) Video Out
- 3.5 MM Jack, HDMI Audio Out
- MMC, SD, SDIO Card slot on board storage
- Linux Operating system
- Dimensions are 8.6cm*5.4cm*1.7cm
- On board 10/100 Ethernet RJ45 jack

Thats what makes Raspberry Pie ideal for Projects.

8.3 HC SR04

8.3.1 Introduction

As shown in figure 8.3, Ultrasonic sensor is a 4 pin module whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popularly used in many applications where sensing objects or measuring distance are required. The module has two eyes like projects in the front which makes the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that is

The Ultrasonic transmits an ultrasonic wave that travels in air and when it gets objected by any material it gets reflected back toward the sensor and this reflected wave is observed by the Ultrasonic receiver module as shown in Figure 8.3

8.3.2 Ultrasonic Sensor Working

Now, to calculate the distance using the above formulae, Everybody should know the Speed and time. Since the project is using the Ultrasonic wave, the universal speed



Figure 8.3: Ultrasonic Sensor

of Ultrasonic wave at room conditions which is a 330m/s. The circuitry inbuilt on the module will calculate the time taken for the Ultrasonic wave to come back and turns on the echo pin high for that same amount of time and this way it can also tell the time taken. Now using this one can simply calculate the distance with help of a micro-controller or a microprocessor.

8.4 Motor Driver Circuit

8.4.1 Introduction

An engine driver IC is an incorporated circuit chip which is generally used to control engines in self-sufficient robots. Engine driver ICs go about as an interface between microchips in robots and the engines in the robot. The most regularly utilized engine driver IC's are from the L293 arrangement,such as L293D, L293NE, etc.These ICs are intended to control 2 DC engines at the same time. L293D comprise of two H-bridge.H-connect is the most straightforward circuit for controlling a low current appraised engine. Engine Driver ICs are principally utilized in self-ruling mechanical technology as it were. Additionally most microchips work at low voltages and require a little measure of current to work while the engines require a generally higher voltages and current . In this manner current can't be provided to the engines from the microchip. This is the essential requirement for the engine driver IC. Figure 8.4 shows a Motor Driver.

8.4.2 Working

The L298N IC gets signals from the chip and transmits the relative flag to the engines. It has two voltage pins, one of which is utilized to draw current for the working of the L298N and the other is utilized to apply voltage to the engines. The L298N switches it yield motion as per the information got from the microchip. For Example: If the chip sends a 1(digital high) to the Input Pin of L298N, at that point the L298N transmits a 1(digital high) to the engine from its Output Pin. Something critical to note is that the L298N essentially transmits the flag it gets. It doesn't change the flag regardless.

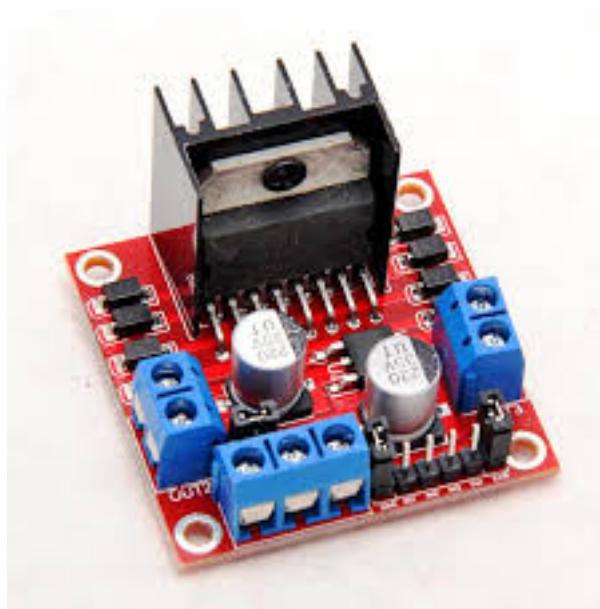


Figure 8.4: Motor Driver

8.5 Motors

8.5.1 Introduction

An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and winding currents to generate force in the form of rotation. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates in the reverse direction, accepting mechanical energy (such as from owing water) and converting this mechanical energy into electrical energy. In certain applications, such as in regenerative braking with traction motors, electric motors can be used in reverse as generators to recover energy that might otherwise be lost as heat and friction. Figure 8.5 shows an image of DC Motor.

8.5.2 Working

Electric motors may be classified by considerations such as power source type, internal construction, application and type of motion output. In addition to AC versus DC types, motors may be brushed or brushless, may be of various phase (see single-phase, two-phase, or three-phase), and may be either air-cooled or liquid-cooled. General-purpose motors with standard dimensions and characteristics provide convenient mechanical power for industrial use. The largest electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. Electric motors are found in industrial fans, blowers and pumps, machine tools, household appliances, power tools and disk drives. Small motors may be found in electric watches.

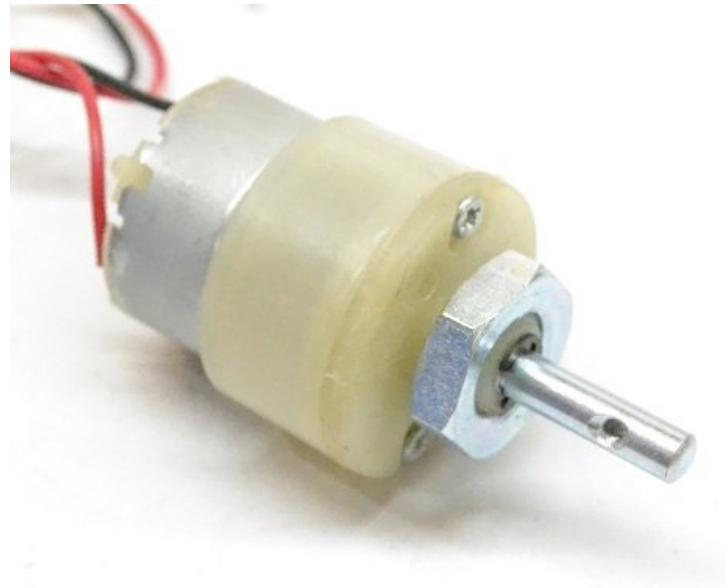


Figure 8.5: DC Motor

8.5.3 Servo Motor

A servo engine is an electrical gadget which can push or pivot an article with extraordinary accuracy. In the event that you need to turn and item at some particular edges or separation, at that point you utilize servo engine. It is simply comprised of basic engine which go through servo instrument. On the off chance that engine is utilized is DC controlled, at that point it is called DC servo engine, and in the event that it is AC fueled engine, at that point it is called AC servo engine. One can get an exceptionally high torque servo engine in a little and light weight bundles. Due to these highlights they are being utilized in numerous applications like toy vehicle, RC helicopters and planes, Robotics, Machine and so forth. Figure 8.6 shows a Servo Motor.



Figure 8.6: Servo Motor

8.6 GPS Module

8.6.1 Introduction

A GPS route gadget, GPS recipient, or just GPS might be a gadget that is equipped for accepting information from GPS satellites thus to ascertain the gadget's land position. exploitation suitable bundle, the gadget could demonstrate the situation on a guide, and it ought to give directions. International, the overall Positioning System (GPS) might be a worldwide route satellite framework (GNSS) made from a system of at least twenty four, anyway by and by thirty, satellites set into space by the U.S. Bureau of Defense.

The GPS was initially created to be utilized by the us military, anyway inside the Nineteen Eighties, the us government enabled the framework to be utilized for regular citizen capacities. tho' the GPS satellite information is free and works wherever inside the world, the GPS gadget and furthermore the related bundle ought to be purchased or leased.

A GPS gadget will recover from the GPS framework area and time information by and large atmosphere, wherever on or near the planet. A GPS gathering needs partner open viewable pathway to four or a great deal of GPS satellites, and is liable to poor satellite flag conditions. In particularly poor flag conditions, for instance in urban zones, satellite signs could display multipath proliferation wherever flags skip off structures, or ar debilitated by natural condition. impeded observable pathways could emerge from a tree spread or inside a structure, as in an exceedingly building, carport or passage. Today, most independent GPS recipients ar used in vehicles. The GPS capacity of cell phones could utilize helped GPS (A-GPS) innovation, which may utilize the base station or cell towers to deliver a speedier Time to introductory Fix (TTFF), especially once GPS signals ar poor or difficult to reach. Be that as it may, the versatile system a piece of the A-GPS innovation wouldn't be open once the cell phone is outside the differ of the portable gathering system, while the GPS aspect would some way or another still be accessible. Figure 8.8 demonstrates a GPS Module and Figure 8.7 shows the Triangulation Process.



Figure 8.7: Satellite Triangulation



Figure 8.8: GPS Module

8.6.2 Module

Diverse GPS contraptions ought to be related with a PC in order to work. This PC can be a home PC, PC, PDA, automated camera, or phones. Dependent upon the kind of PC and available connectors, affiliations can be made through a consecutive or USB interface, similarly as Bluetooth, CompactFlash, SD, PCMCIA and the more state-of-the-art ExpressCard. Some PCMCIA/ExpressCard GPS units also consolidate a remote modem. Contraptions for the most part don't go with pre-presented GPS course programming, in this manner, once acquired, the customer must present or create their own one of a kind item. As the customer can pick which programming to use, it might be better planned to their own taste. It is astoundingly essential for a PC-based GPS beneficiary to come bundled with a course programming suite. Furthermore, GPS modules are out and out more affordable than complete free systems (around 50 to 100). The item may fuse maps only for a particular area, or the entire world, if programming, for instance, Google Maps are used. A couple of masters have also made a couple of GPS devices and freely discharged the plans. Points of reference fuse the Elektor GPS units. These are based around a SiRFstarIII chip and are for all intents and purposes indistinguishable to their colleagues. Distinctive chips and programming executions are moreover available

8.7 Keypad 4*3

8.7.1 Introduction

This 4x3 lattice keypad has 16 worked in pushbutton contacts associated with line and section lines. A microcontroller can filter these lines for a catch squeezed state. In the keypad library, the Propeller sets all the segment lines to information, and all the line lines to include. At that point, it picks a line and sets it high. From that point onward, it checks the section lines each one in turn. On the off chance that the section association remains low, the catch on the line has not been squeezed. On the off chance that it goes high, the microcontroller realizes which push (the one it set high), and which segment, (the one that was recognized high when checked). The keypad library supports pretty much any number of rows and columns. So, the program has to tell the keypad ,it has 4 rows and 3 columns, which I/O pins the lines are connected to, and what value each button represents. The rows, cols, and values arrays store that information. The rows array will be used to tell the keypad library that the top row is connected to P7, the second row to P6 and so on. Likewise, the cols array lists the leftmost column as connected to P3, the next over connected to P2 and so on. The values array stores the value the project want the program to give us for each button press. For example, if the top-left button is pressed, the project want the number 1 and if the next one over is pressed,the project want the number two. If the top-right button is pressed, the project want the ASCII code for the 'A' character which is 65.Figure 8.9 shows a 4*3 Keypad.



Figure 8.9: 4*3 Keypad

8.8 MPU 9250

8.8.1 Introduction

The MPU-9250 is the organization's second era 9-pivot Motion Processing Unit for cell phones, tablets, wearable sensors, and other purchaser markets. The MPU-9250, conveyed in a 3x3x1mm QFN bundle, is the world's littlest 9-hub MotionTracking gadget and joins the most recent InvenSense structure developments, empowering drastically decreased chip size and power utilization, while in the meantime improving execution and cost. The MPU-9250 MotionTracking gadget sets another benchmark for 9-pivot execution with power utilization just 9.3A and a size that is 44 percent littler than the organization's original gadget. Gyro clamor execution is 3x better, and compass full scale go is over 4x superior to aggressive contributions. The MPU-9250 is a System in Package that joins two chips: the MPU-6500, which contains a 3-hub spinner, a 3-hub accelerometer, and a locally available Digital Motion Processor equipped for preparing complex MotionFusion calculations; and the AK8963, the market driving 3-pivot computerized compass. The MPU-9250 backings InvenSense's market demonstrated MotionFusion. A solitary plan can bolster the MPU-9250 or MPU-6500, giving clients the adaptability to help either gadget in various item SKUs. The MPU-9250 incorporates the accompanying extra highlights: Helper ace I2C transport for perusing information from outer sensors (for example weight sensor), 3.5mA working current when every one of the 9 movement detecting tomahawks and the DMP are empowered VDD supply voltage scope of 2.4 - 3.6V, VDDIO reference voltage for helper I2C gadgets, Littlest and most slender QFN bundle for compact gadgets: 3x3x1mm, Insignificant cross-pivot affectability between the accelerometer, spinner and magnetometer tomahawks, 512 byte FIFO cradle empowers the applications processor to peruse the information in blasts, Advanced yield temperature sensor, Client programmable advanced channels for whirligig, accelerometer, and temp sensor. Figure 8.10 shows the MPU 9250 Board.

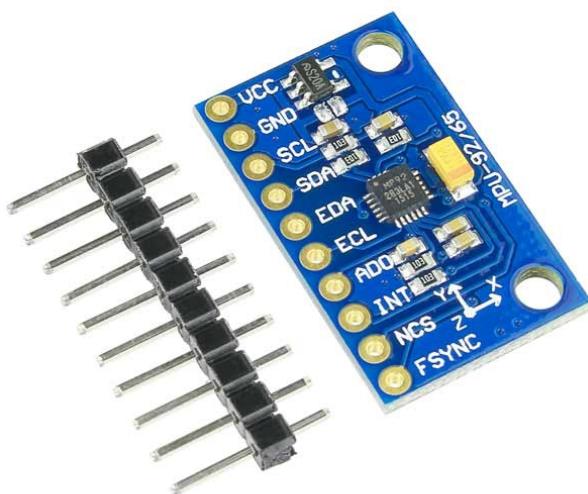


Figure 8.10: MPU 9250

8.9 LCD

LCD (Liquid Crystal Display) screen is an electronic presentation module and a wide scope of utilizations. A 16x2 LCD show is fundamental module and is all around normally utilized in different gadgets and circuits. These modules are favored more than seven portions and other multi portion LEDs. The reasons being: LCDs are prudent; effectively programmable; have no impediment of showing unique and even custom characters (not at all like in seven segments), movements, etc. A 16x2 LCD implies that it can show 16 characters for every line and there are 2 such lines. In this LCD each character is shown in 5x7 pixel grid. This LCD has two registers, in particular, Command and Data. The direction register stores the order guidelines given to the LCD. An order is a guidance given to LCD to complete a predefined task like instating it, clearing its screen, setting the cursor position, controlling showcase and so forth. The information register stores the information that is shown on the LCD. The information is the ASCII estimation of the character to be shown on the LCD. Figure 8.11 shows the LCD Module.

8.9.1 Features

- Intelligent, with implicit Hitachi HD44780 good
- LCD controller and RAM giving straightforward interfacing
- 61 x 15.8 mm seeing region
- 5 x 7 dab network position for 2.96 x 5.56 mm characters, in addition to cursor line
- Can show 224 distinct images
- Low power utilization (1 mA run of the mill)
- Powerful order set and client created characters



Figure 8.11: LCD Pin Diagram

- TTL and CMOS good
- Connector for standard 0.1-pitch pin headers

8.10 Battery

Lead Acid battery that uses sponge lead and lead peroxide for the conversion of the energy into wattage, such form of battery is named a lead acid battery. The lead acid battery is most typically employed in the facility stations and substations as a result of it's higher cell voltage and lower price. Batteries use a chemical change to try to work on charge and turn out a voltage between their output terminals. The reaction of lead and lead compound with the acid solution produces a voltage. The activity of energy to and external resistance discharges the battery. The discharge reaction are often reversed by applying a voltage from a charging supply. Figure 8.12 shows a DC Battery.



Figure 8.12: DC Battery

Chapter 9

Algorithm and Flowchart

9.1 Algorithm

1. Set Source and Destination.
2. Find Shortest Path Possible.
3. Make Direction Angle Difference equal to zero.(So that the rover is facing towards the destination change coordinates precisely)
4. Start Traversing along the direction through the path
5. When Ultrasonic Sensor values becomes high, divert course
6. If both the values of Ultrasonic go low, Use Servo to take average of values by seeing left and right, Go where the average is high.
7. if(Direction Difference !=0) goto Step 3
8. When Destination coordinates equals current location, Stop
9. Send a Random Pincode to the Client's Email Id
10. When client pincode equals Sent pincode, Open Case
11. Set Source as the New Destination.
12. goto Step 2
13. Stop at Step 7

Figure 9.1 shows the Flowchart of whole System.

9.2 Flowchart

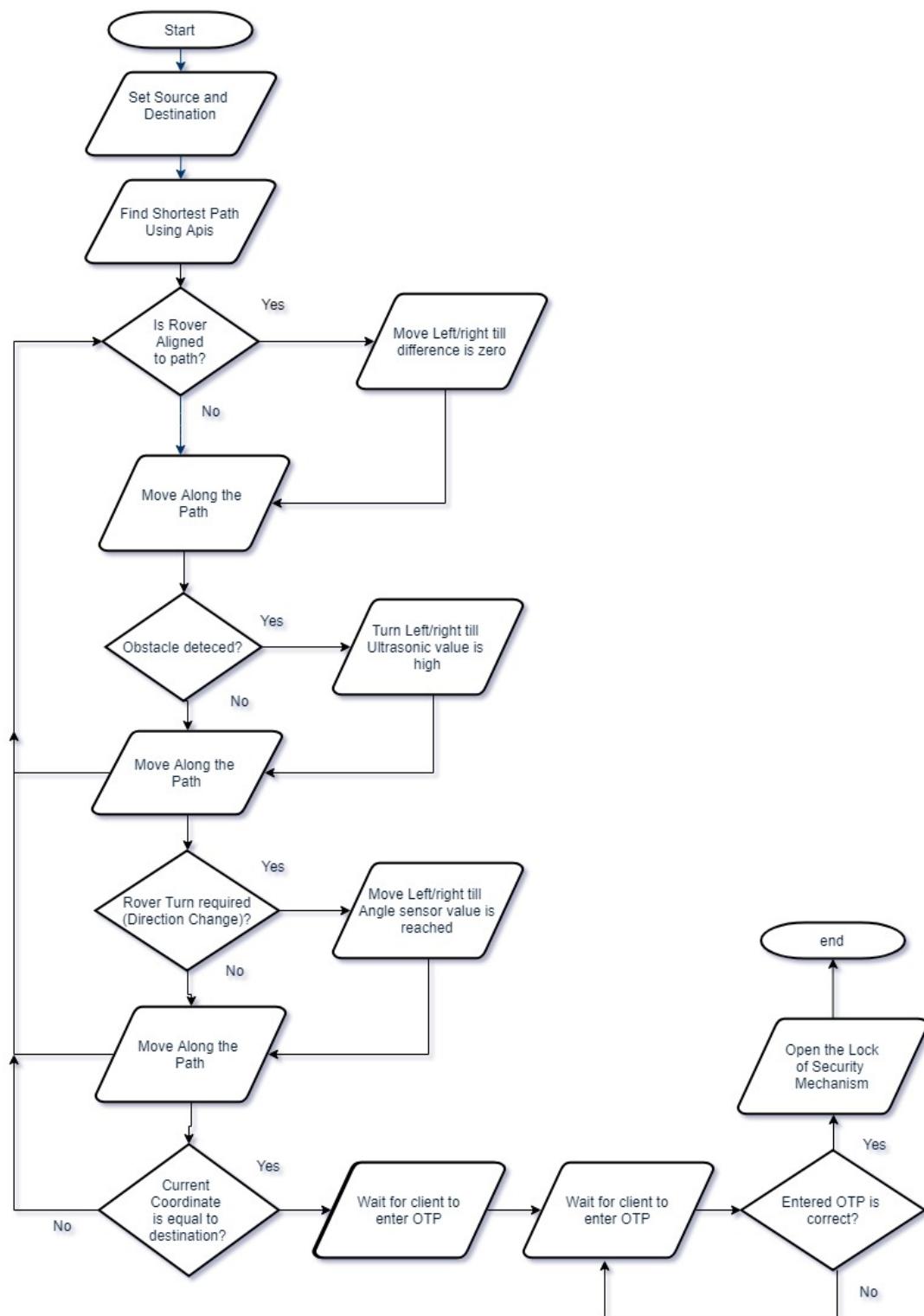


Figure 9.1: Flowchart

Chapter 10

Results

After creating the structure and mounting the circuit the project was started with checking all the connections by doing the continuity test each section to verify the connections on the PCB whether it had any fault or not. There were a few errors found that is the connections were loose so the project was made then right. After that was done and the project was assured of that all the connections are in place and the next step was to check the output at each stage. Here are some of the images which indicate the output at various stages.

10.1 Design of Rover

Rocker Bogie design was implemented using PVC Pipes. Figure 10.1 shows the Design of Rocker Bogie made using Pipes. Figure 10.2 shows the top view.

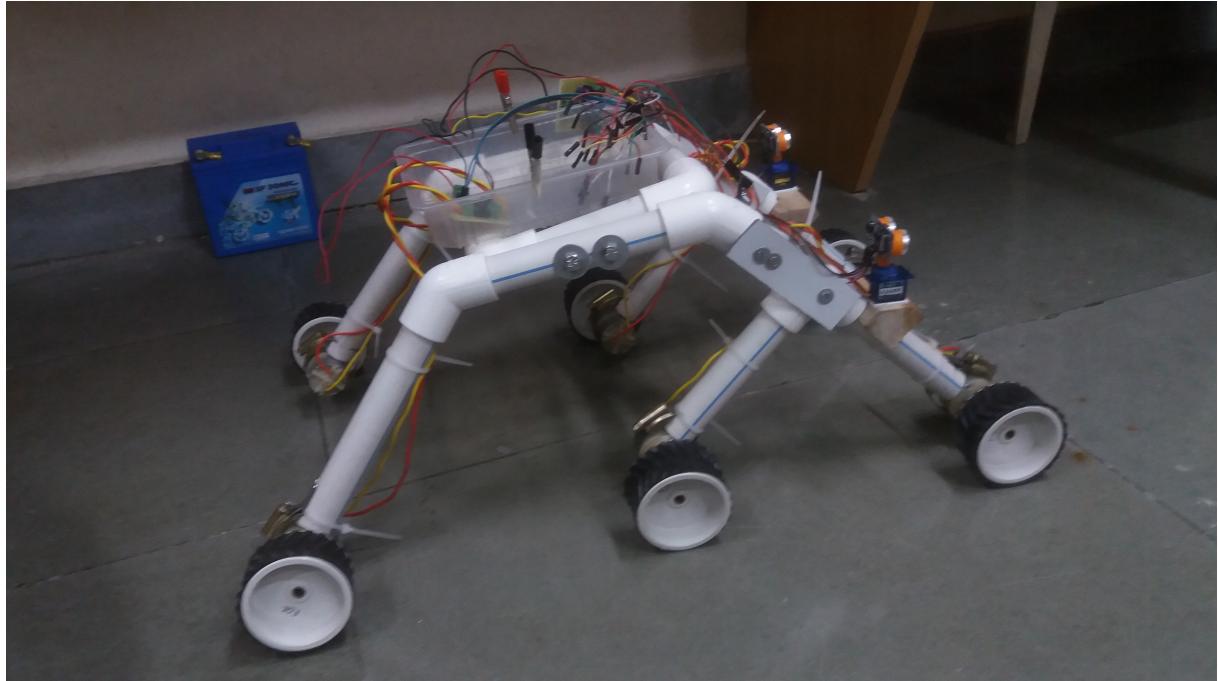


Figure 10.1: Rocker Bogie

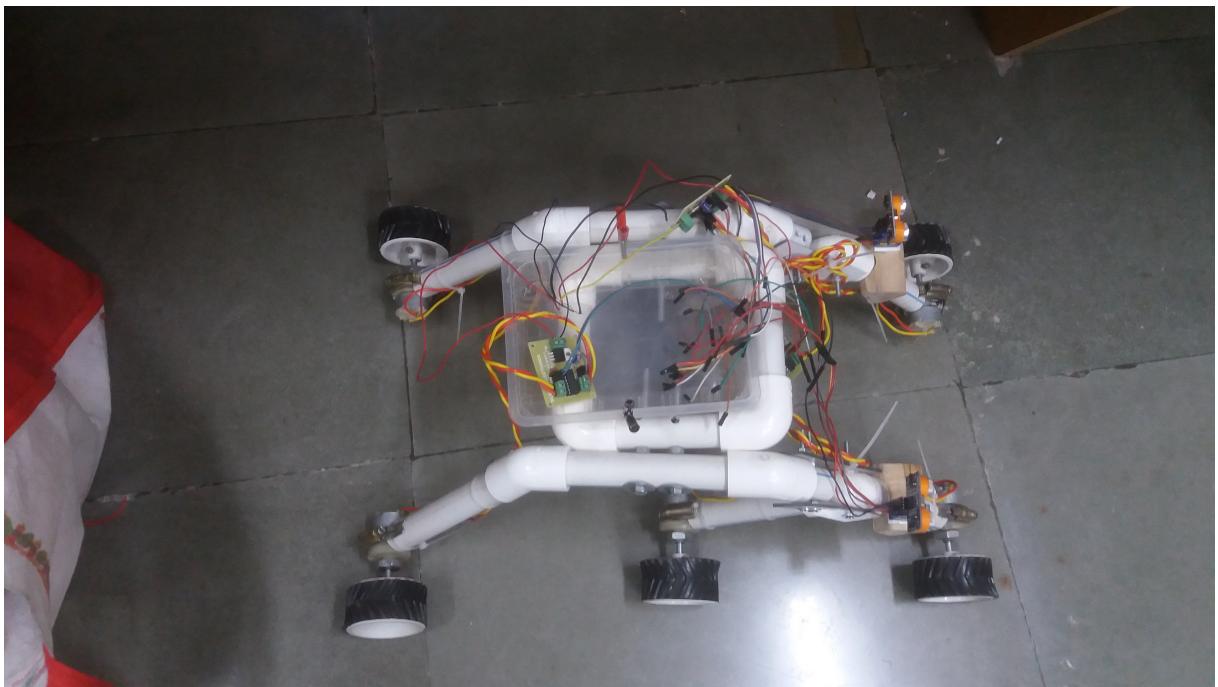


Figure 10.2: Top View

10.2 Security Mechanism

Security Mechanism was built using a Plastic box .The project used an aluminum lock attached to a servo motor which moves in only 0 to 180 degrees.It also has LCD display and 3*4 keypad.All this components are attached to an Arduino.This Arduino is dedicated for the whole security thing inside the box powered by a battery.It receives a signal including the pincode from Raspberry Pie upon reaching the destination.

The Following figures shows the Security Mechanism made up of plastic box,LCD,Dialpad,Servo and Arduunio board.

Figure 10.3 shows the Security Mechanism when Locked waiting to be unlocked.

Figure 10.4 shows the Security Mechanism when unlocked.



Figure 10.3: Security Mechanism Lock



Figure 10.4: Security Mechanism UnLock

Chapter 11

Project Road Map

The project began by researching about the project with the various papers and tests carried out over the period of time. After studying the IEEE papers and many other known journals and proceedings the scope of project understood about the different ways in which the acquired signal can be processed. Below shown are the figures of the project. Some of the important options were considered here and then decided with the microcontroller which was going to be used in the project. After considering all the parameters the project was decided to go for the Raspberry Pie 3 Model B and Arduino Uno microcontroller which uses the Atmega 328 IC in it.

11.1 Rocker Bogie Design

The project demanded thought of many things which can be used to make the rover design. The project started with PVC Pipes as they are quite strong and scalable to perform drilling ,cutting operations for aligning and symmetry of the project rover

11.2 Obstacle Avoidance

The project was made using 2 HC-SR04 Ultrasonic modules on top of 2 Servo Motors on the left and right wheel of the rover for precise detection and Avoidance of Objects with proper logic with also the help of Angle Sensor.

11.3 Navigation

The project inspired thought of User Defined Map. So the college campus was taken for experimentation as it is quite near and large enough with roads. But then the project realised why not Google Maps to do the same. Hence the project was started looking online for APIs and hence found them from Google Itself. There are many APIs by Google Maps for various operations. But The concern is just the direction API. This Direction API gives the JSON response consisting of Key Value Pairs which includes the information of the path by giving a HTTP Request. This Path Data consists of Coordinates which the project is using for traversal.

11.4 Security Mechanism

The project wanted to create a prototype of Lock Mechanism so the project sticked for using a Plastic box and an Arduino UNO which drives the servo motor,LCD Display and Keypad/Dialpad. The Raspberry Pie sends a mail to the client when the rover reaches its destination which the Client is supposed to enter in the keypad.Which further unlocks the box and authorises the client to get access of his package.

Chapter 12

Application

Delivery Rovers have a lot of applications in numerous fields, It also has Industrial scopes. Basically it is an automation project so, its uses are not just limited to Delivery.

- Package Delivery in small premises with large load and paths with bumpy surfaces.
- Food Delivery in local Areas.
- An enlarged version of this project is a self driving car in small campuses, building, etc
- Bot for Security or military purposes as it can move over terrains and mountains.

12.1 Advantages

- Can carry significant load over it
- Can climb stairs, Mountains, bumpy surfaces, etc
- Fully automatic obstacle avoidance
- Automatic Navigation
- Very Useful for small premises
- Very Rare chances of rover collapsing or stopping due to unclimbable object
- Can be extended to self driving car
- Highly Versatile to make it change the whole application as it is an efficient and reliable Rover to embed it with sensors as required like Camera, Lidar, etc

12.2 Disadvantages

- High Torque motors are needed so they require more Power from battery.
- The threshold weight it can carry upon itself is limited by the design material used, Motor quality (torque), battery used, etc
- GPS Module used it highly inaccurate giving deviation in latitude and longitude of +/- 18 Meters which is totally not acceptable.

- High precision GPS System using better GNSS are available but they are very costly.
- As the model is small anybody can mess with it and very limited amount of actions can be taken for that as it is automated.
- Lastly the area,it can cover for Navigation is limited,As the project wanted a balance between precision and reliability.

Chapter 13

Conclusion

In this project we made a prototype of a Self Driving Car. This is based on embedded processors, to meet the current requirement of delivery applications and to overcome the problems of automation. Here are a few outcomes which are successfully implemented

- The rover design made it possible to run over uneven surfaces.
- Obstacle avoidance mechanism avoids obstacles of considerable size.
- GPS and Google Maps api helps to find the trajectory.
- Security Mechanism ensures the package delivery only to the client.

Chapter 14

Future Scope

- This Project is highly Versatile as it is made to travel luggage.
- The fact that this project is intended to carry light luggage makes it highly versatile.
- Its mode of operation can be completely changed just by replacing or adding the sensors it carries along with it by proper programming.
- For Example, This project can be programmed to follow its master,work in stealth, spy on target,garbage collection,etc.
- This project can open new doors for delivery purposes which are frequent and nearby,hence reducing or eliminating manpower to create sustainable development.
- The algorithms used in this project can be used easily by drones to find shortest path and travel on it.

Chapter 15

Cost Analysis

Serial No.	Items	Quantity	Per Cost (Rs.)
1	Raspberry Pi 3B+	1	3000
2	Arduino Uno	2	450
3	Motor Driver(L298D)	3	540
4	Memory card	1	300
5	Micro Servo Motor	2	115
6	Motors	6	125
7	PVC Pipe + other design-stuff	1	700
8	Wheels	6	45
9	Hang Tie pack	1	25
10	LCD	1	130
11	I2C LCD Backpack - PCF8574	1	100
12	4x3 Dial pad	1	100
13	Manual latch	1	20
14	Plastic Box	1	85
15	Crocodile Clips	2	20
16	12V Battery	1	400
17	Wooden Block	2	0
18	Neo GPS Module	1	650
18	Ultrasonic Sensor	2	150
19	PVC Pipe 90 degree Angle	2	45
20	PVC Pipe 45 degree Angle	4	45
21	PTFE Plumbers Pipe Sealing Tape	1	10
22	Power bank	1	850
23	Angle Sensor	1	450
24	Miscellaneous	-	1000

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