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College Bus Tracking System using GSM and GPS

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Abstract – Traffic is increasing rapidly day by day which leads to fail the scheduled timetable of the transportation. So, if buses get delayed is mainly result in the wastage of time of the student. In this paper, we proposed the concept about to track the bus to avoid the time wastage and to reduce the human efforts also to reduce the chance of missing bus. The present generation requires the information time to time. The use of technology has been increasing day by day. So, we are planning for the combination of present technology with the requirement of information transmission, we planned for the creative approach of "College Bus Tracking System using GPS and GSM". The main aim is to find out the location of the college bus using GPS (Global Positioning System) and GSM (Global System for Mobile communication) and without using internet at the user's end. Using GPS and with GSM the user can know the location of the bus by an SMS (Short Message Service). All the students have to store their database (i.e. mobile number) in GSM module.

Keywords - Raspberry pi Pico, GPS, GSM, Tracking, Location and College Bus.

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I. Introduction:

Tracking and monitoring of vehicles are increasing in urban areas as many commercial and private vehicles are available large in numbers. Many organizations and individuals find a need for tracking nowadays for safety. Logistics companies need to track vehicles when precious cargos are carried. Individuals track and monitor their vehicles as a concern for safety. Public transport vehicles are half-track these days to produce voters with transportation detail. This involves investment an oversized quantity of cash into the system. So, the system developed here is principally aimed toward reducing price in pursuit systems and it's to be enforced in college buses that take a selected route on a daily basis. Also, this will be implemented to conveyance vehicles. The most aim is to search out the situation of the bus mistreatment GPS (Global Positioning System) and GSM (Global System for Mobile communication) while not using the web at the user's end. Mistreatment GPS with GSM the user will recognize the situation of the bus by causation an SMS (Short Message Service). The Global Positioning System (GPS) is a navigation system using satellites, a receiver and algorithms to synchronize location, velocity and time data for air, sea and land travel. The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse find its compatibility in so many applications. It

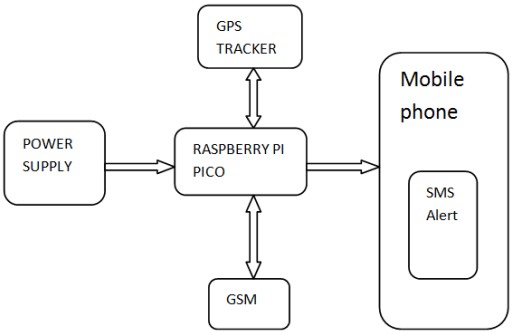


Fig 1: Block Diagram

is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. The Global System for Mobile Communications (GSM) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets.

II. Hardware Implementation

1. GPS Module

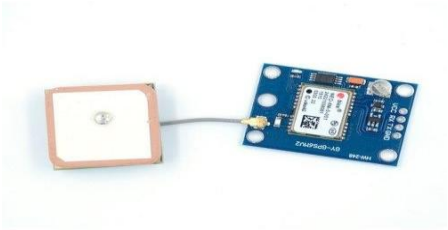


Fig 2 : Neo 6M GPS Module

The term GPS full type is "Global Positioning System" that could be a satellite navigation system that furnishes location and time data all told climate conditions to the user. GPS is employed for navigation in planes, ships, cars, and trucks also. The system provides vital skills to military and civilian users round the globe. The trailing system will improve client Service by: up latency to customer calls. Up ETA (Estimated Time of Arrival) accuracy. Permitting business homeowners to give notice their customers just in case a service is running late Promoting effective marketing. The GPS consists of 3 segments: The area segment, the GPS satellites, the management system, operated by the U.S. military, the user segment, which has each military and civilian users and their GPS equipment. SECURITY IN GPS: GPS chase is that the police work of location through use of the world Positioning System (GPS) to trace the situation of associate entity or object remotely. The situation accuracy is anyplace from a hundred to ten meters for many equipment. Accuracy is often pinpointed to among one meter with special military-approved equipment.

2. RASPBERRY PI PICO:

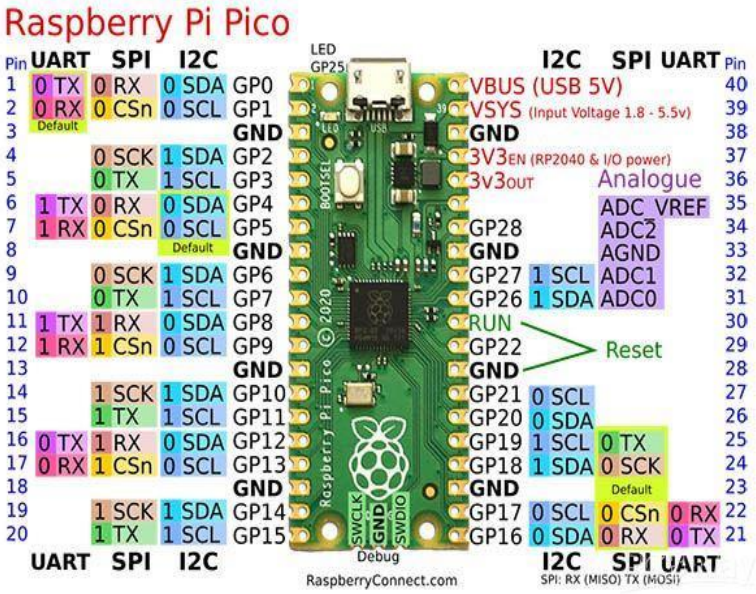


Fig 3: GPIO pins on Raspberry pi pico

A Raspberry Pi Pico may be a low-priced microcontroller device. Microcontrollers are small computers, however they have an inclination to lack giant volume storage and peripheral devices that you just will insert (for example, keyboards or monitors). A Raspberry Pi Pico has GPIO pins, very similar to a Raspberry Pi computer, which suggests it will be wont to management and receive input from a spread of electronic devices. The Raspberry Pi Pico was recently free by the Raspberry Pi Foundation as a competitive microcontroller within the ASCII text file physical science sphere. The Pico shares several of the capabilities of common Arduino boards including: analog-to-digital conversion (12-bit ADC), UART, SPI, I2C, PWM, among others. The board is simply 21mm x 51mm in size, creating it ideal for applications that need low-profile designs. one among the innovations of the Pico is that the dual-core processor, which allows data processing at clock rates up to 133 megacycle one explicit draw of the Pico is its compatibility with small Python, that is chosen because the programming tool for this project. The main target on small Python, as critical C/C++, minimizes the confusion and time needed to urge beginner with the Pico. A Raspberry Pi four pc is good for interfacing with the Pico, which might be accustomed prepare, debug, and program the Pico. From start to complete - this tutorial helps users run their initial custom small Python script on the Pico

in precisely a number of minutes. RGB diode is going to be used to demonstrate general purpose input/output of the Pico microcontroller.

2.1 GPIO Pins on Raspberry Pi Pico:

In Raspberry Pi Pico, out of forty pins, twenty six pins are multi-functional GPIO pins. These 26 GPIO pins is used each as digital input and digital output. These digital pins are marked from GP0, GP1, and up to GP22. The marked GP23, GP24, and GP25 aren't they're exposed on the pin out these GPIO pins are used for internal board functions. GPIO29: information science employed in ADC mode (ADC3) to live VSYS/3, GPIO25: OP Connected to user LED, GPIO24: IP VBUS sense – high if VBUS is present, else low, GPIO23: OP Controls the on-board SMPS Power Save

2.2 ADC or Analog to Digital Converter Pins

The board comes with four 12-bit SAR based mostly analog to digital converters. Hence, we are able to use these pins to scan analog inputs from varied sensors. however one out of those four pins (ADC 4) don't seem to be provided as a GPIO pin on the board. This fourth ADC pin is internally connected to a temperature sensor.

ADC pin	GPIO pin
ADC 0	GP 26
ADC 1	GP 27
ADC 2	GP 28

Table 1: ADC and GPIO pins

2.3 UART Pins And SPI Pins on Raspberry Pi Pico

The Raspberry Pi Pico conjointly contains 2 identical UART peripherals. UART (universal asynchronous receiver-transmitter) pins are used for asynchronous serial communication between the micro-controller associate degreed UART devices or alternative microcontrollers. Serial Peripheral Interface (SPI) is an interface bus that's wont to transfer information between the microcontroller and SPI-enabled devices. Raspberry Pi Pico supports two SPI interfaces that are

UART Pins	GPIO Pins	SPI Controller	GPIO Pins
UART0-TX	GP0/GP12/GP16	SPIO_RX	GP0/GP4/GP16
UART0-RX	GP1/GP13/GP17	SPIO_TX	GP1/GP7/GP19
UART1-TX	GP4/GP8	SPIO_CLK	GP2/GP6/GP18
UART1-RX	GP5/GP9	SPIO_CSn	GP1/GP5/GP17

Table 2: UART Pins And SPI Pins on Raspberry pi Pico

III. GSM TECHNOLOGY:

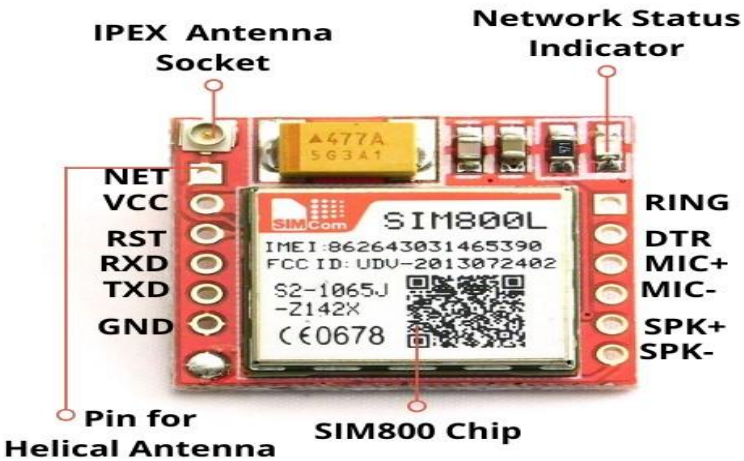


Fig 4: GSM Module

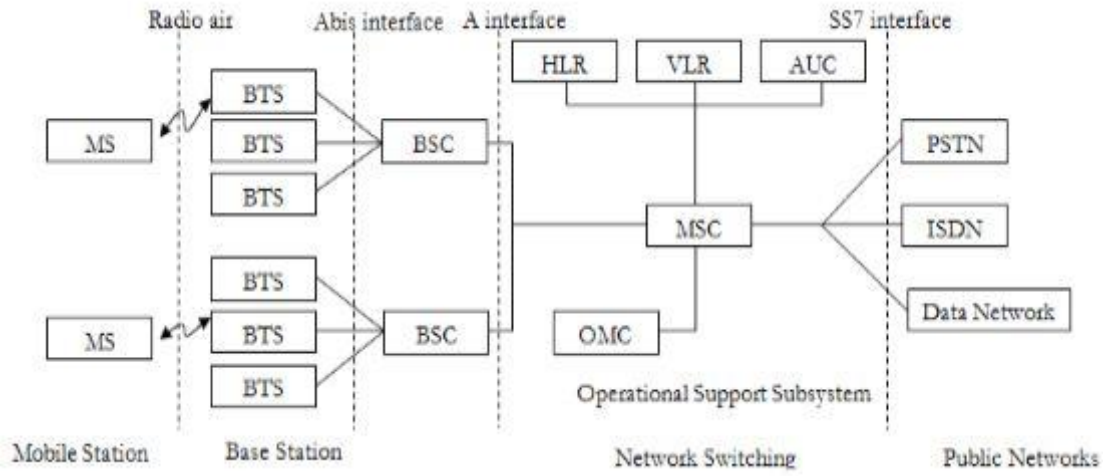


Fig 5: GSM Network Architecture

Global system for mobile communication (GSM) could be a globally accepted standard for digital cellular communication. GSM is that the name of a standardization cluster established in 1982 to form a typical European mobile phone standard that might formulate specifications for a pan-European mobile cellular radio system in operation at 900 rates. International system for mobile communication is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz it's calculable that many countries outside of Europe can be a part of the GSM partnership. GSM, the world System for Mobile communications, could be a digital cellular communications system ,which has chop-chop gained acceptance and market share worldwide, though it had been at first developed in an exceedingly European context. Additionally to digital transmission, GSM incorporates several advanced services and features, together with ISDN compatibility and worldwide roaming in different GSM networks. The advanced services and design of GSM have created it a model for future third generation cellular systems, equivalent to UMTS. this may offer an outline of the services offered by GSM, the system architecture, the radio transmission. Security in GSM: On air interface, GSM uses secret writing and TMSI rather than IMSI, SIM is provided 4–8-digit PIN to validate the possession of SIM. Algorithms are specified, authenticated, encrypted, key generation.

SOFTWARE

Thonny is that the package that we've got use to execute the commands and follow it whenever the system is within the modify state. Thonny is an IDE for python that's designed for the Beginners. This IDE is being developed by the Aivar Annamaa and contributors which are principally used for writing python programs and also the supporting platform of this IDE are Windows, Linux, and macos. This IDE is usually most well-liked by the beginners because it supports other ways of stepping through the code and that we can even see the gradual expression analysis and we can also observe the detail mental image of the decision stack and a mode for explaining the thought of reference and heap. This IDE is principally used for the coming up with of the comes by the beginners because it contains the binary bundles together with python interpreter or pip put in package that is that the installed package seen in Debian, Raspberry pi, Ubuntu and Fedora.

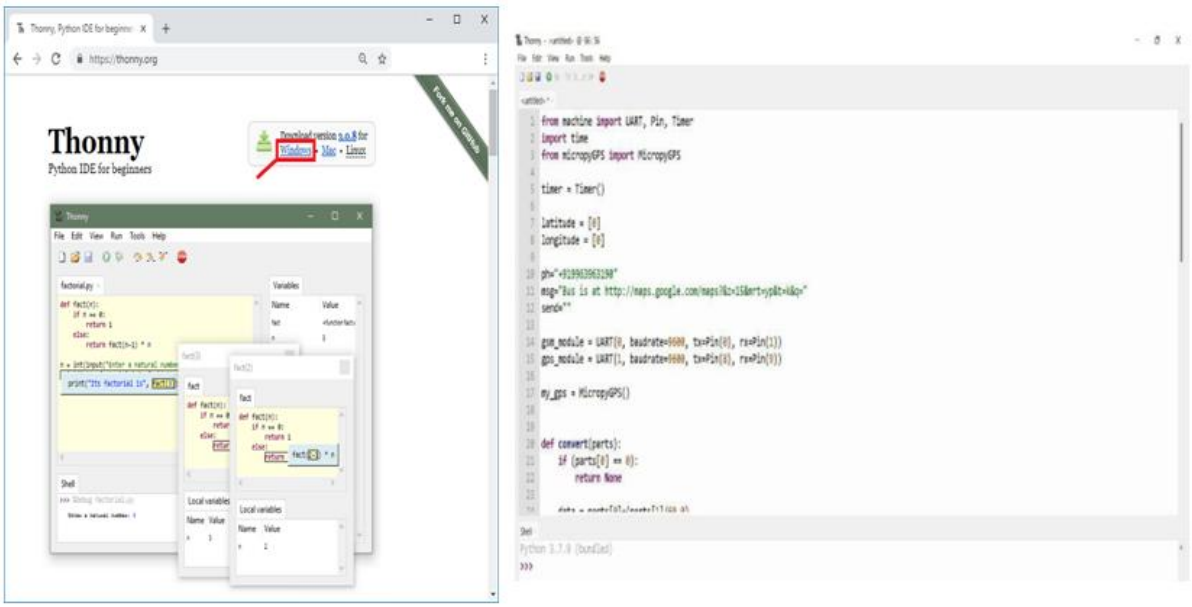
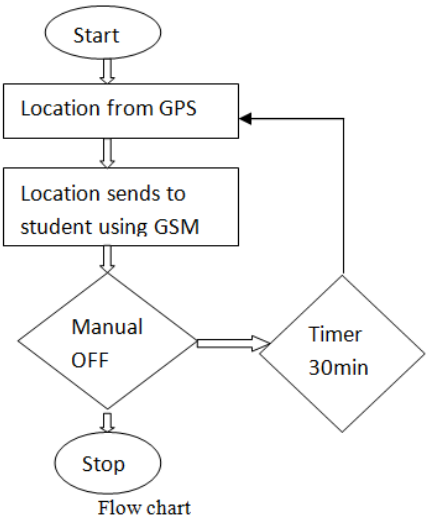


Fig 6: Images of Thonny Software

Circuit Design and Implementation



Flow chart

The entire student's info (i.e. mobile number) is kept in GSM module. We have a tendency to inserting this GSM module in conjunction with GPS module within the faculty bus.GPS system endlessly tracks the bus location in terms of latitude and line of longitude and sends it to the microcontroller thorough serial driver. Microcontroller sends this information to GSM module and GSM module send SMS message of that information to the stored mobile numbers. Microcontroller takes input from GPS module method it and send response through GSM module. After GPS module connected to minimum needed satellites, it'll realize co-ordinates of its location and sends those knowledge to microcontroller. Then the microcontroller sends data to GSM module. The microcontroller wills all the operations. It handles each input and output. GSM module sends data via SMS to user. GSM module sends data through GSM network to anyplace within the world.

IV. RESULTS

Micro Python may be a lean and economical implementation of the Python three programming language that a little set of the Python normal library and is optimized to run on microcontrollers and in forced environments. The small Python py board is a compact electronic card that runs small Python on the vacant metal, supplying you with a low-level Python OS that may be wont to management all types of electronic projects. Small Python is packed with advanced features reminiscent of interactive prompt, absolute preciseness integers, closures, list comprehension, generators, exception handling and more. Nonetheless it's compact enough to suit and run inside 256k of code area and 16k of RAM. Small Python aims to be as compatible with traditional Python as potential to permit you to transfer code with ease from the desktop to a microcontroller or embedded system.

Transmitter Section:

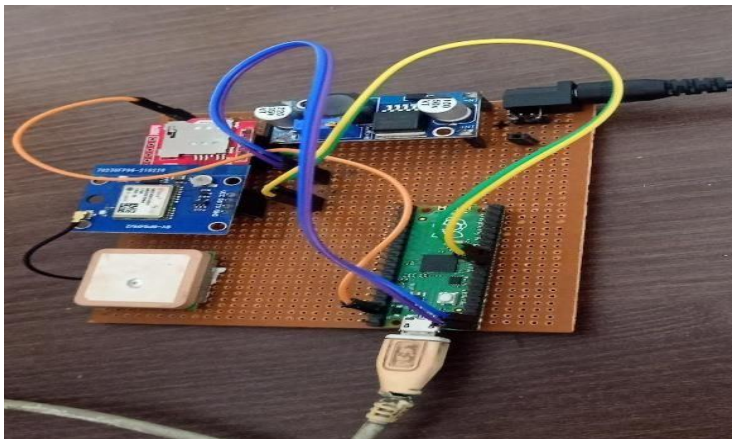


Fig 7 : The setup of Project

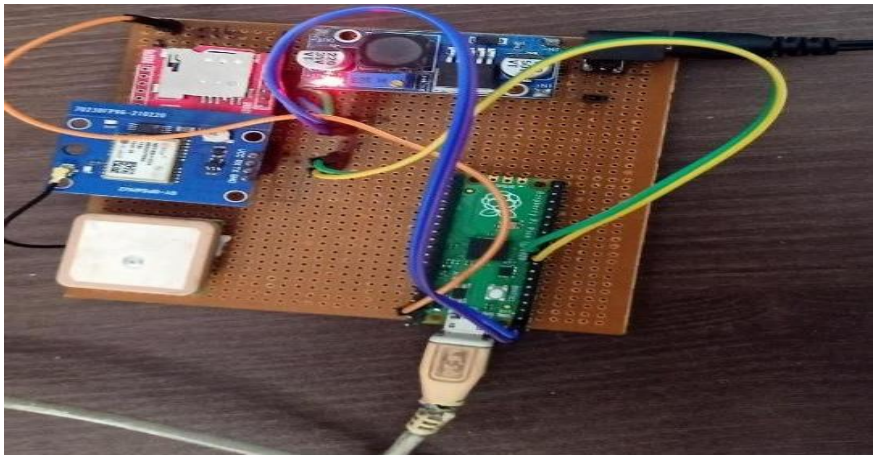


Fig 8: power supply of 12v and 5v is given to the device

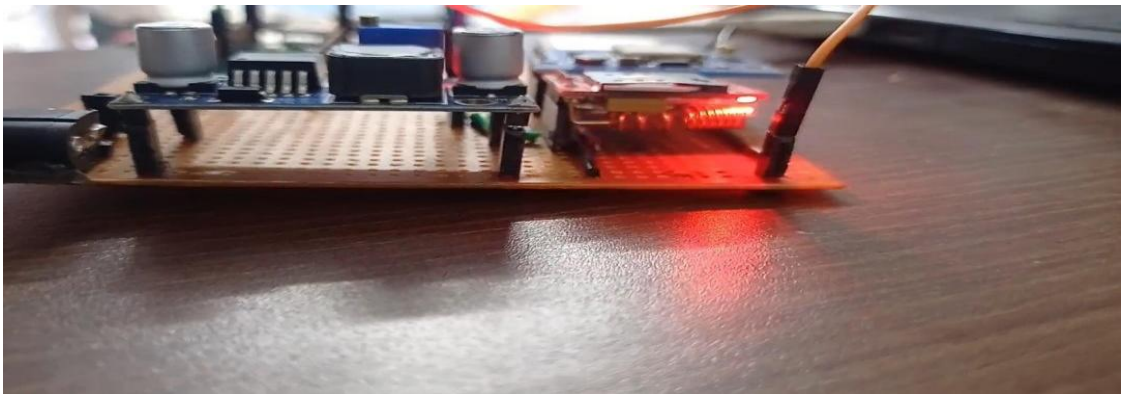


Fig 9: GSM is connected, and then the led to GSM is blinked for every 3 seconds indicating the connection.

Receiver section:

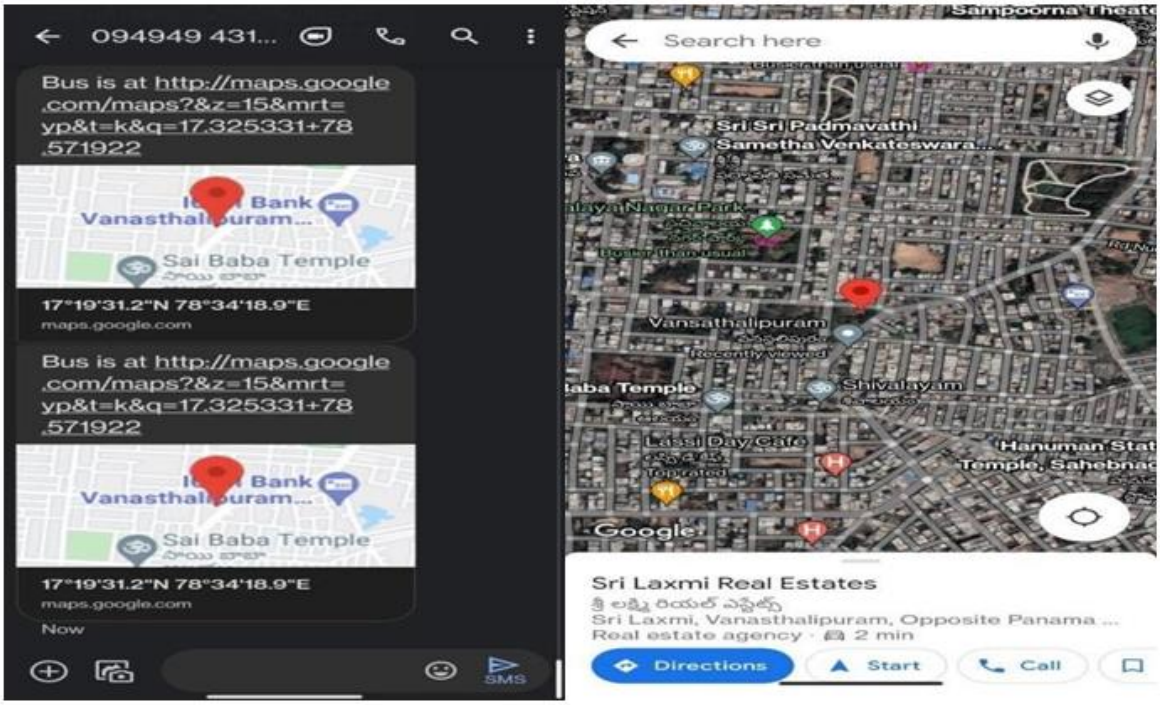


Fig 10: Output Case 1

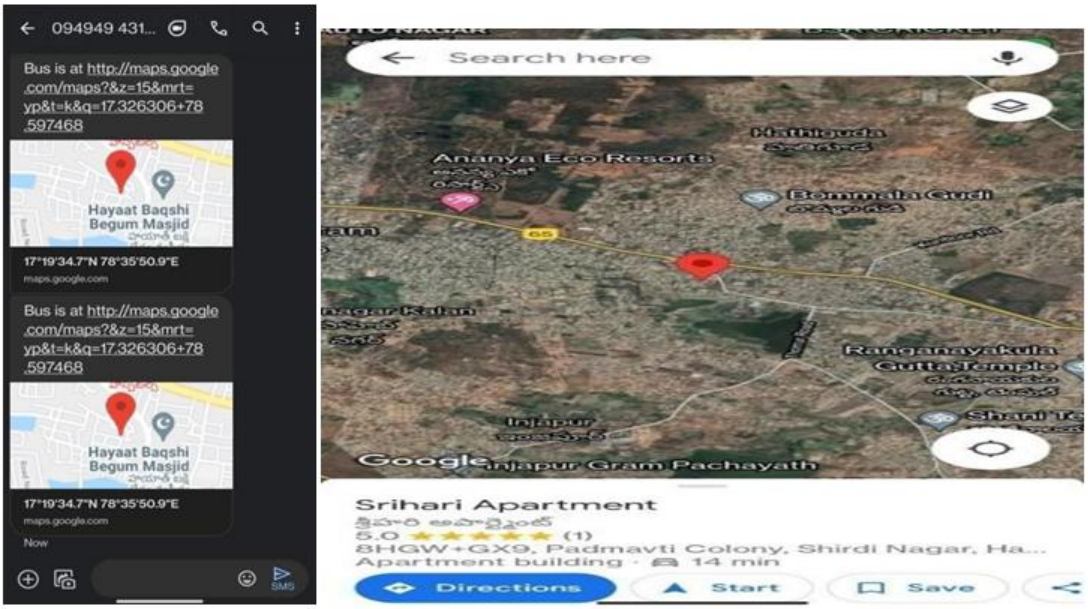


Fig 11: Output Case 2

GSM then sends the situation to the keep numbers within the microcontroller. The above pictures are the result locations of the module once placed in numerous places. The SMS comes for each ten seconds whereas location changes accordingly, once gap the SMS there'll be link that shows the location of the bus shown in the above figures.

V. CONCLUSION

College bus chase systems are unremarkably utilized by fleet operators for fleet management functions resembling fleet tracking, routing, dispatch, on-board info and security. Quality Tracking: corporations desirous to track valuable assets for insurance. Field Service

Management: corporations with field service personnel for services such as repair or maintenance should be able to set up field workers. Time, schedule sequent client visits and be able to operate these departments efficiently. Plan, schedule and route your faculty bus fleet with efficiency. Time-saving compared to managing manually, have a transparent image of operating hours. Mechanically controlled and simple to use. Since we can track the bus activity it makes us to converse longer and work efficiently. With the assistance of this we are able to prepare properly on the times once we get on my feet late and miss the temporal order. If we miss the bus in our stop we can check for the near coach station and its timing to arrive there accordingly.

VI. FUTURE SCOPE

The main goal of the planned work is to boost the Bus trailing system by adding the mandatory options to our project, like sticking correct bus timings, presenting correct bus numbers and by adding a GPS hunter into it for accurate locations. For future enhancement, we are able to develop a vehicle watching system mistreatment GPS & GSM module with high speed processor. The system are often put in buses, cars and trucks, thus this project has a large scope. at the side of this we can produce a bus price tagging system wherever the user can really obtain a digital ticket a bit like the UTS app within the metropolis railways. during which app take this location of the user enkindle the destination and calculate the fare we are going to additionally offer pay choice from varied third half app similar to Paytm, PayPal and so forth we are able to generalize the project to someone wherever user can implement the hardware part to the non-public vehicles which can facilitate them to trace their location once it's been purloined it'll also police. We are able to extend it to personal agency to track their bus.

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