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LONG RANGE FLIGHT STATUS MONITORING SYSTEM FOR A MAV

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***Abstract*—Micro Air Vehicles (MAVs) are becoming vastly popularin the areas of surveillance and reconnaissance for militaryand civilian use, however, their instability due to their small size renders them useful to only a handful of pilots. We propose implementing a GPS-based navigation systemfor use in autonomous flight of micro air vehicles. Previousefforts in this area have produced a vision-based horizontracking algorithm capable of sustained level flight withuser input. Our goal is to improve on this flight system usinginformation from a GPS receiver and other resources (IoT). In this paper we firstintroduce MAVs and the resources used. We next discuss the integration of the GPS navigationsystem by describing the design of the hardware systemand software algorithms for navigation and control.The GPS based navigation system has been successfullybuilt and integrated, and currently is in the testphase of development.**

Index Trems—microcontroller P89C52RD2,sensors,GPS, LCD display,GSM,Zigbee,

I. INTRODUCTION

In this Project it is proposed to design an embedded system which is used for tracking and positioning of any MAV by using Global Positioning System (GPS) and Global system for mobile communication (GSM). In this project AT89S52 microcontroller is used for interfacing to various hardware peripherals. The current design is an embedded application, which will continuously monitor a moving MAV and report the status of the MAV on demand. For doing so an AT89S52 microcontroller is interfaced serially to a GSM Modem and GPS Receiver. A GSM modem is used to send the position (Latitude and Longitude) of the MAV from a remote place. The GPS modem will continuously give the data i.e. the latitude and longitude indicating the position of the MAV. The GPS modem gives many parameters as the output, but only the NMEA data coming out is read and displayed on to the LCD. The same data is sent to the mobile at the other end from where the position of the MAV is demanded. The hardware interfaced to microcontroller is LCD display, GSM modem and GPS Receiver. The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels. When the request by user is sent to the number at the modem, the system automatically sends a return reply to that mobile indicating the position of the MAV in terms of latitude and longitude.

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INTRODUCTION TO IoT:

The Internet of Things is the expansion of the current Internet services so as to accommodate each and every object which exists in this world or likely to exist in the coming future. This article discusses the perspectives, challenges and opportunities behind a future Internet that fully supports the “things”, as well as how the things can help in the design of a more synergistic future Internet. Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts. There are several fuzziness about the concept of Internet of Things such as IoT can be broken in two parts Internet and Things.

The worldwide network of interconnected computer networks based on a standard communication protocol, the Internet suite (TCP/IP) while a things is an object not precisely identifiable.
The world around us is full of objects, smart objects and the existing service provider known as Internet. The convergence of the sensors like smart objects, RFID based sensor networks and Internet gives rise to the Internet of Things. With increased usage of sensors the raw data as well as distributed data is increasing. Smart devices are now connected to Internet using their communication protocol and continuously collecting and processing the data. Ubiquitous computing which was thought as a difficult task has now become a reality due to advances in the field of Automatic Identification, wireless communications, distributed computation process and fast speed of Internet. From just a data perspective the amount of data generated, stored and processed will be enormous. We focused on making this architecture as a sensor based architecture where each sensor node will be as important as the sensor network itself. Visualizing each sensor as having intelligence is the ultimate aim of any architecture in the IoT domain.

II. LITERATURE SURVEY

Design and implementation of a GPS-based Navigation system for micro air vehicles Scott Kanowitz Michael Nechyba. Machine Intelligence Laboratory, Department of Electrical and Computer Engineering, University of Florida, Gainesville, FL 32611-6200
In this paper we first introduce MAVs and the current vision-based navigation system. We next discuss the integration of the GPS navigation system by describing the design of the hardware system and software algorithms for navigation and control.

Dissemination for Real-Time Applications Peter Danapdana@mail.utexas.ed Department of Geography, University of Texas at Austin, Austin TX 78712-1098 Consultant, P. O. Box 1297, Georgetown, TX 78627 **.**
This paper presents an overview of the Global Positioning System (GPS) for the potential precise time and time interval user with

special reference to real-time systems. An overview of GPS operation is presented and GPS error sources are described as they relate to the timing user.

A GPS Pseudo range Based Cooperative Vehicular Distance Measurement Technique
Daiqin Yang, Fang Zhao, Kai Liu, Hock Beng Lim, Emilio Frazzoli , Daniela Rus
In this paper, we propose a cooperative vehicular distance measurement technique based on the sharing of GPS pseudo range measurements and a weighted least squares method.

Design and implementation of a GPS-based navigation system For micro air vehicles
Scott Kanowitz
This paper implements a GPS-based navigation system for use in autonomous flight of micro air vehicles. Previous efforts in this area have produced a vision-based horizon tracking algorithm capable of sustained level flight with user input.Our goal is to improve on this flight system using information from a GPS receiver.

III. PROPOSED SYSTEM

In this project we will use the IOT (internet of things) technology, GPS as well as GSM modem. Project describes the long range **FLIGHT STATUS** monitoring system for a **MAV**. Here we propose a system of automated information to be available to the Base and also theinstantaneous relay of the Alert Levels and the Replay of the course of journey, the pilot hadcovered till the time back to him.
In this paper, we present the design of SensTrack, a location tracking service that provides user's moving trajectory while reducing its impact on the device's battery life. By applying different localization technologies, we expand the coverage area compared to the traditional approach that only uses GPS. In addition, the sensor hints from the smartphone itself can help us make decisions about adaptive sampling. SensTrack smartly selects the location sensing methods between WiFi and GPS, and reduces the sampling rate by utilizing the information from acceleration sensor and orientation sensor, two of the most common sensors found on smartphones today. We present the detailed design of an energy-efficient location tracking service, SensTrack. As the main component, a track reconstruction algorithm based on Gaussian Process Regression is proposed.

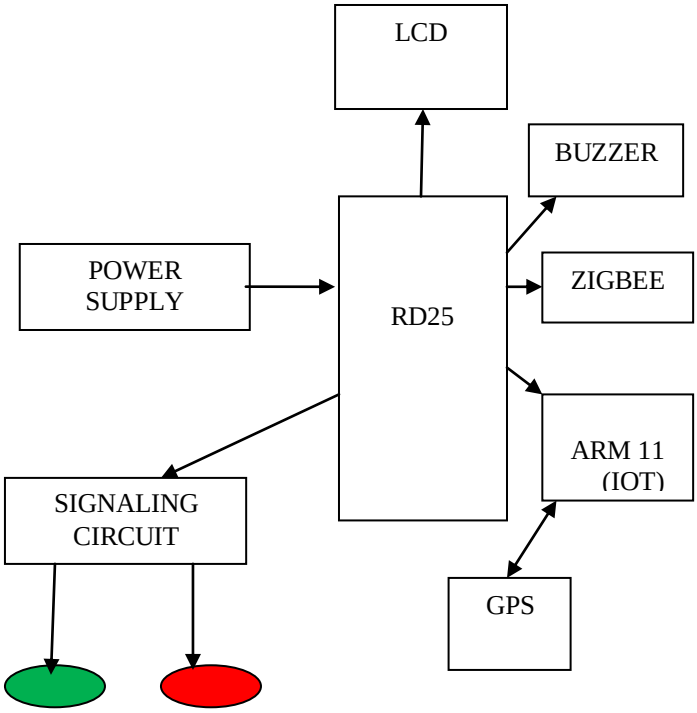
The main contributions of this paper are listed as follows:

• We identify the problems of traditional location tracking service including limited availability of GPS and unnecessary GPS samplings. The opportunities of energy efficiency improvements by utilizing the assistance from sensors on smartphones are discussed.
• We present the detailed design of an energy-efficient

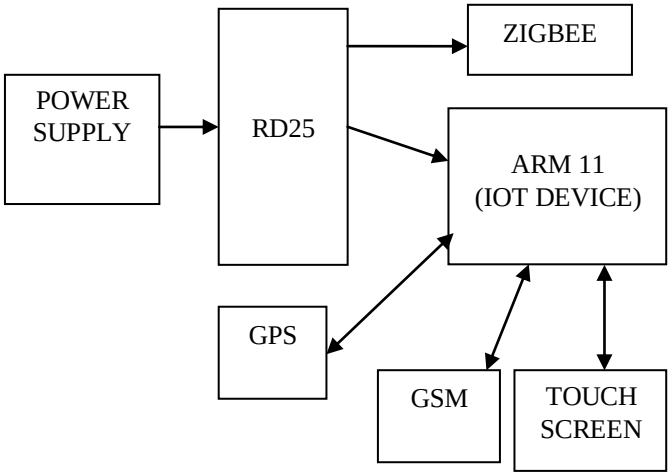
location tracking service, SensTrack. As the main component, a track reconstruction algorithm based on Gaussian Process Regression is proposed. Other mechanisms for making smart adaptive sampling decisions are also discussed.
• We implement a prototype of SensTrack, and evaluate the proposed system through real-world experiments.

We split the project into 3 parts:
1. The Pilot's side.
2. The External Hardware implementation.
3. The Control Base station.

Figure1: MAV Base Station.



The project is vehicle positioning and navigation system we can locate the vehicle around the globe with 8052 micro controller, GPS receiver, GSM modem, MAX 232, EEPROM. Microcontroller used is AT89S52. The code is written in the internal memory of Microcontroller i.e. ROM. With help of instruction set it processes the instructions and it acts as interface between GSM and GPS with help of serial communication of 8052. GPS always transmits the data and GSM transmits and receive the data. GPS pin TX is connected to microcontroller via MAX232. GSM pins TX and RX are connected to microcontroller serial ports.
Figure2: Transmitter.



Microcontroller communicates with the help of serial communication. First it takes the data from the GPS receiver and then sends the information to the owner in the form of SMS with help of GSM modem. GPS receiver works on 9600 baud rate is used to receive the data from space Segment (from Satellites), the GPS values of different Satellites are sent to microcontroller AT89S52, where these are processed and forwarded to GSM. At the time of processing GPS receives only $GPRMC values only. From these values microcontroller takes only latitude and longitude values excluding time, altitude, name of the satellite, authentication etc. E.g. LAT: 1728:2470 LOG: 7843.3089 GSM modem with a baud rate 57600.GSM is a Global system for mobile communication in this project it acts as a SMS Receiver and SMS sender. EEPROM is an Electrically Erasable read only memory which stores is used to store the mobile number. The power is supplied to components like GSM, GPS and Micro control circuitry using a 12V/3.2A battery .GSM requires 12v,GPS and microcontroller requires 5v .with the help of regulators we regulate the power between three components.

IV. COMPONENTS REQUIRED:

A. Microcontroller - AT89C51RD2BN:

The main center part of the project is the microcontroller. Here microcontroller.The P89V51RD2 are 80C51 microcontrollers with 64kB flash and 1024 B of data RAM. A key feature of the P89V51RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (six clocks per machine cycle) to achieve twice the throughput at the same clock frequency.
The flash program memory supports both parallel programming and in serial ISP. Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible.

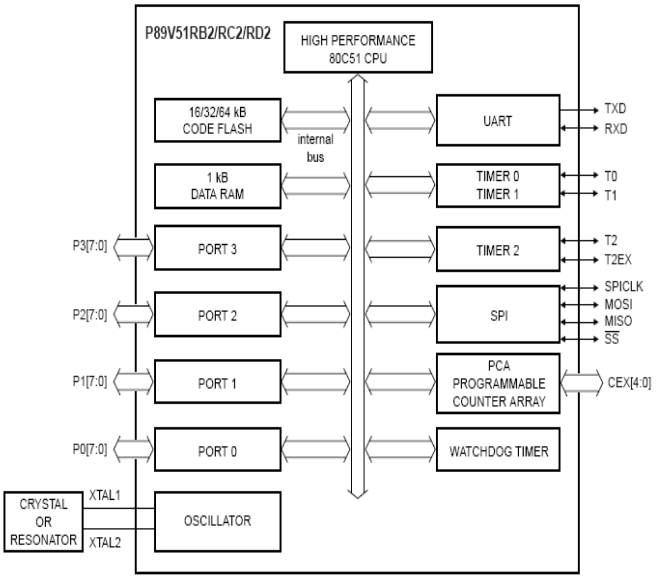


Figure3: P89C52RD2

B. LCD - 16 x 2:

They have ability to display not just numbers, but also letters, words and all manners of symbols. Thismakes them a good deal more versatile than the familiar seven segment LED display.

C. Rs232 - MAX232:

The other component is the MX 232, RS 232 driver used mainly for the communication with the computer. Since the microcontroller RS 232 protocol logic is 5 volt and computer RS 232 protocol is 12 volt logic. To convert the 5 volt logic to 12 volt and 12 volt logic to 5 volt we use this chip MX 232.By using this we can communicate with computer and the microcontroller. If for instance if we don't use this MX 232 converter between microcontroller and the computer, the data coming from the computer will always be 1 even if the data is 0.because at the 12 volt logic 0 = 5 to 6 volt and logic 1 = 12volt.whereas at the microcontroller logic 0 =1 volt or 0volt and logic 1 = 5 volt or above 1.5 volt. So if we don't use a converter always the microcontroller will take data as high and the computer will take as 0.So this MX 232 is a RS 232 protocol level converter.

D. GSM Modem:

A GSM network is composed of several functional entities, whose functions and interfaces are specified. Figure 1 shows the layout of a generic GSM network. The GSM network can be divided into three broad parts. The Mobile Station is carried by the subscriber. The Base Station Subsystem controls the radio link with the Mobile Station. The Network Subsystem, the main part of which is the Mobile services Switching Center (MSC), performs the switching of calls between the mobile users, and between mobile and fixed network users. The MSC also handles the mobility management operations. Not shown is the Operations and Maintenance Center, which oversees the proper operation and setup of the network. The Mobile Station and the Base Station Subsystem communicate across the Um interface, also known as the air interface or radio link. The Base Station Subsystem communicates with the Mobile services Switching Center across the A interface.

E. Power supply:

An AC to DC adaptor has been used to get DC input for the mother board. In mother board, we have developed a 5V regulator circuit, which is needed for microcontroller as supply voltage. IR transmitters are also connected to 5V supply, so that they always transmit high signal. LM7805 is used for 5V regulated supply.

V. SOFTWAREUSED

- Embedded c.
- Keil-c compiler.
- Flash magic burner software.

VI. ADVANTAGES

- Flight mechanism sturdy.
- Low cost.
- Simple to Maintain

- No complex architecture involved.
- Efficient use of IoT.
- Provides endurance in covert mission of military application.
- Easy to control the MAV.

VII. APPLICATIONS

- MAV tracking system.
- Distance tracking system
- Speed tracking system.
- Senstrack system which is used to know the last good location of the MAV lost.
- By doing little modification same can be applied for any other flight's tracking system.
- Private network calling in flight mode.

VIII. TECHNICAL SPECIFICATIONS

- Operating voltage of embedded circuitry is 12vdc.
- Current consumption of device in active mode 200mill amp.
- Operating frequency of device is 11.0592MHZ.

IX. FUTURE SCOPE

The range of the MAV can be increased by using a better RF module. It can provide wide variety of applications by using basic GPS receiver which costs less. Thus, the implemented system can pave a way for developing other system using high end GPS with lot of new features and advancements, so that applications such as vehicle tracking , tourists guide software etc.., can be developed in the future.

X. CONCLUSION

MAVs are of mountain importance in various military applications like surveillance and covert operations. This involves the operator standing from a designated place invisible to the enemy. This will actually lower the endurance of the MAV as in some cases the MAVs are out of sight, of the operator. This jeopardizes the mission. Hence, by the assistance of our project the controllability of the MAV increases thus increasing the endurance of the MAV.

The GPS based navigation system is reliable and is verified in different environments. The proposed system provides the solution for some of the main problems faced by the existing navigation system.

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