HYBRID INDOOR AND OUTDOOR POSITIONING SYSTEM WITH MEMS BASED INERTIAL MOTION SENSOR

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Abstract : In this paper we deal with the navigational system which is to be used to determine the object that it can be positioned indoor and outdoor as well. The position of the system is measured by the MEMS sensor. This project is cost effective and light in weight. The primary concern of the module is that it detects the object by tracking the GPS module. The microcontroller finds its importance in developing this module.

In order to enable fields of application, that require both outdoor and indoor navigation, the present approach handles the realization of sensor data fusion between low-cost and GPS as well as the reference system development for long-term indoor application based on GSM signals or image processing. The overall goal is given in keeping the benefits of low-cost inertial navigation while obtaining the reference systems long-term stability and reliability in order to accomplish shading-free object navigation within a single low-cost system.

Index Terms **–** MEMS Sensor, Tracking System, GSM Module.

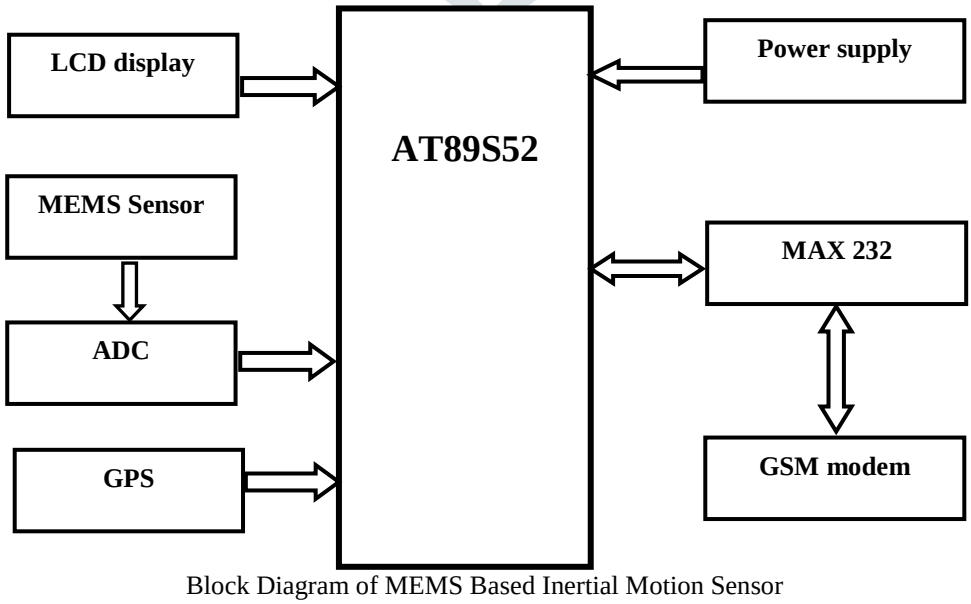
I. INTRODUCTION

To develop hybrid indoor and outdoor positioning system with MEMS based inertial motion sensor which helps us in tracking any misplaced objects if the GPS is added this device gives the indication of its position by calculating the attitudes. Using location and job information in one integrated environment allows for the first time creating a synchronized information base for planning and implementation of logistics, which in the sequel can be used for optimizing the delivery procedure and for quick and accurate reactions on any unforeseen changes. The results are less loss of time, more efficient and lock-free use of resources.

In practice, INS is to be often coupled with different localization systems, for example with a Global Positioning System (GPS) receiver device that periodically provides absolute position data while the INS is used to interpolate the intercostals value. Furthermore, advanced signal processing algorithms can help to reduce the error of position and the orientation to achieve a better time performance. For that it is usual to make use of estimation filters like the Kalman filter and to eliminate additional errors evoked by parasitic effects like G-acceleration and Carioles' Effect. In addition to that the use of extra sensors on the inertial platform can provide helpful data, such as the measurement of the earth's magnetic field.

PROPOSED METHODOLOGY

It was found out that even sensors can be used as security devices one among that which gives an effective security system is MEMS. In the proposed methodology our device has MEMS sensor which alerts if any object is lost as we are emplacing .GSM along with the MEMS system. Once the object moves this is tracked by the MEMS in the signal is send to the GSM and a message is sent to the authorized person giving the information that the object is a misplaced.



Block Diagram of MEMS Based Inertial Motion Sensor

The working principle of the indoor and outdoor navigation is based on the measurement of object movements with the help of mass inertia under acceleration. For this, an orthogonal constellation of both three acceleration and three angular rate sensors is needed (x,y,z). This assembly allows the determination of all accelerations and angular moments applied on any object moving in space, without requiring signals from the entire environment. The acceleration sensors are used to capture translational movements in the three spatial (x,y,z)directions. The angular rate sensors (gyroscopes) capture the rotational speeds of the three spatial axes.

TECHNICAL SPECIFICATIONS:

HARDWARE:

Micro controller	AT89S52
Crystal Oscillator	11.0592 MHz
MEMS sensor	
GSM	SIM900
LCD display	16x2
Power supply	
Max232	
ADC	
Transformer: 12V step down	
Filter: 1000uf/25V	
Voltage Regulator: 7805, 7812	

SOFTWARE:

Kiel IDE

UC flash

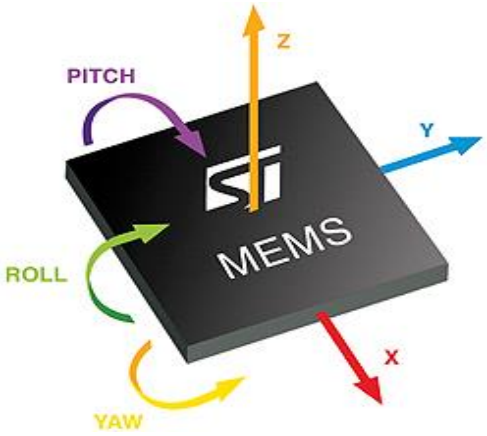
Proteus

FEATURES OF MICRO CONTROLLER

- Compatible with MCS-51® Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory– Endurance: 1000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- Three-level Program Memory Lock
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer
- Power-off Flag

MEMS sensor

MEMS Small Highly Accelerometer can detect acceleration and vibration by measuring the motion in the X, Y and Z axis simultaneously. MEMS devices are divided into two different categories: micro sensors that detect information and actuators that respond to information. MEMS devices are already used in such fields as the automotive industry where they are incorporated into airbag and vehicle control; medicine where they are used to control medication dosing and control medical devices such as pacemakers; and construction where they are used in building materials that can sense changes in environmental stresses.



MEMS sensor

GSM MODULE SIM900

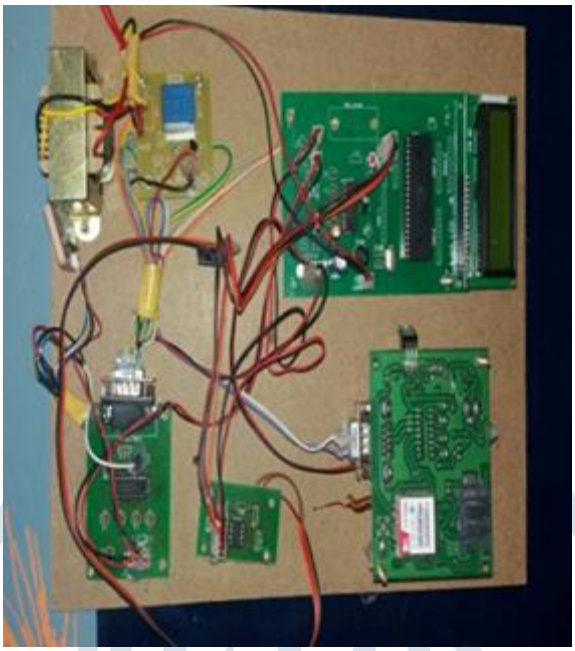
A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT (which means ATtention) and finish with a <CR> character. For example, the dialing command is ATD<number>; ATD3314629080; here the dialing command ends with semicolon.

GSM SIM 900 module

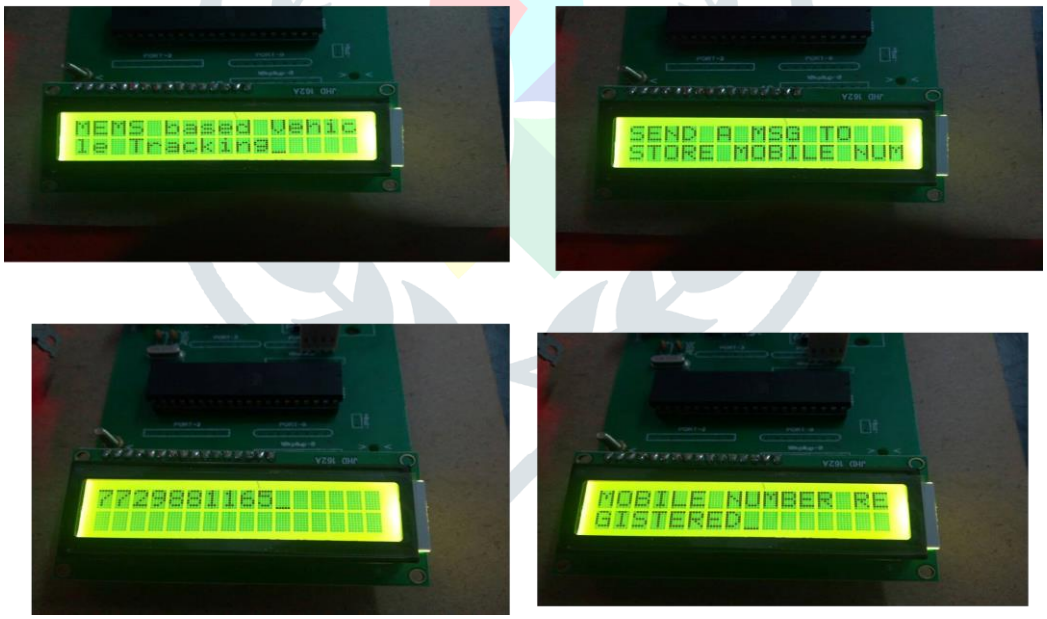
APPLICATIONS:

- Security systems
- Automotive domain
- Consumer domain
- Military
- Industrial domain
- Bio technology

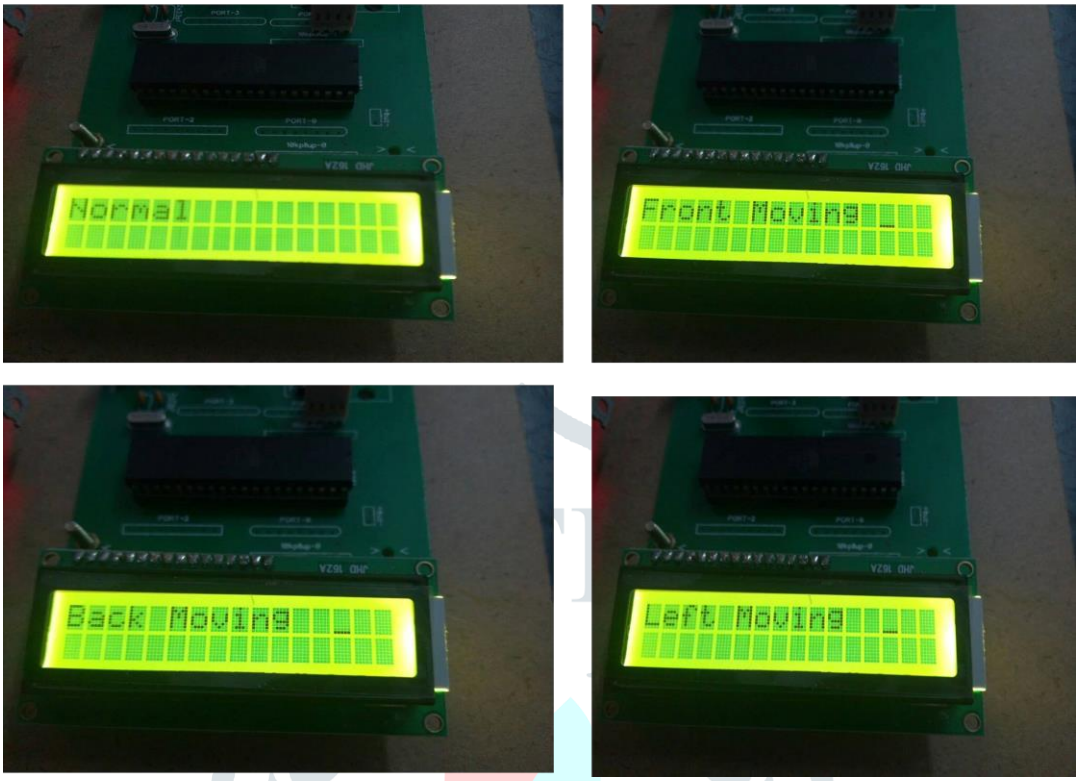
IV. RESULTS AND DISCUSSION



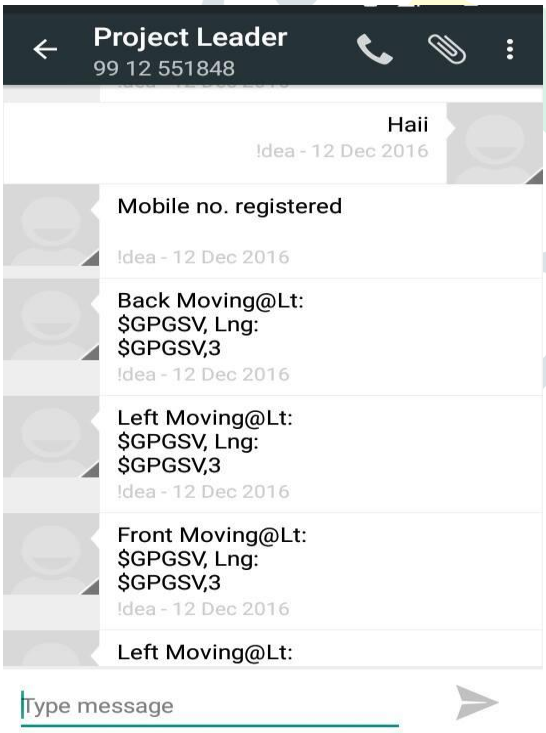
Project view

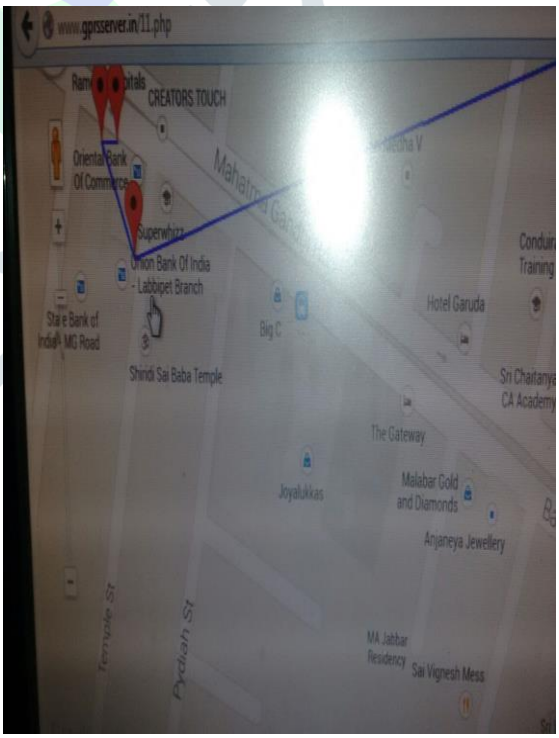


Display of Mobile number registration



Display of project operation





CONCLUSION

To develop hybrid indoor and outdoor positioning system with MEMS based inertial motion sensor which helps us in tracking any misplaced objects if the GPS is added this device gives the indication of its position by calculating the attitudes.

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