

Asset Tracking and Accident Detecting Using NI MyRIO

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Abstract:

Tracking materials takes a totally new hue, be it storage or movement of freight on road. Damage to the freight may incur huge cost on both time and money spend. Thus, proactive real time monitoring by multiple agencies can be an important clue for preventive maintenance in the bud. Asset tracking systems developed around various objects interconnected by different communication technologies. Each of these devices function through local and/or remote interaction with the real world or other devices and systems. The problem of ensuring a dependable and responsive controller that is capable of handling and servicing such devices, process voluminous data without compromising responsiveness is still eminent. In this paper, we present a solution that was designed using in-lining approach to develop a real-time asset tracking and accident detecting system with global positioning system. The system is composed by a NI (National Instruments) myRIO controller to transmit wireless sensor data.

Keywords — Asset tracking system, NI myRIO, real-time, global positioning system, wireless, accelerometer.

I. INTRODUCTION

Automated inventory management and asset tracking address the problems with traditional methods for collecting, storing, and retrieving information on a large number of assets within a company, organization, or institution. In this context, an asset is a high valued object, like a mobile computer or handheld electronic device. There are numerous applications in our daily life that requires the monitoring (tracking) of a wide variety of objects in real time. A number of tracking systems are available in the market; however, many lack flexibility in terms of tracking features and cost of operation is higher. With increasing number of incidents of object thefts, the development of a low-cost and flexible asset tracker has become important. The objective of this work is to develop such an object tracking system using low-cost off-the-shelf components. Another objective is to add flexibility and power to the tracking mechanism by incorporating various sensors with the system. When objects (like vehicles, for example) are spread out over a wide geographical area, the persons concerned often find it difficult to keep

at any given point of time, for how long it has been moving, where exactly did it go, and also the environment to which is has been subjected to. As an example, the need to track consumer vehicles in real time is very important and can be used to prevent any kind of theft and misuse of the vehicle. The basic communication technologies used for the same are the Global Positioning System (GPS) Receiver to track the latitude and longitude of the object using global positioning satellites.

A real time[1] geographical positioning with high accuracy is established using NI (National Instruments) MyRIO controller equipped with real time technologies which communicates with a laptop as the host computer and a GPS module. Using an appropriate soft application accomplished in LabVIEW sets the current positioning on Google Earth Map and saves the GPS data into documents. Parameter sensing and object tracking [2] consists of real time. Object tracking system build using the Arduino UNO-R3 microcontroller board and the GR-87 GPS module. It operates on a portable

battery operated object tracking system. It can also sense environmental parameter like temperature. The personal asset tracking system [3] can identify the item and the time when it was lost. The tracking system is mainly composed of a mobile transmitting module and a receiving module carried by a person. Personal objects are attached with the transmitting module and a receiving module is used to track and secure different objects. The transmitting module consists of encoding circuit and wireless transmitting circuit. And the receiving module is composed of receiving, decoding and alert circuits. Asset tracking systems [4] developed around the Internet of Things paradigm are composed of a collection of various objects interconnected by different communication technologies eminent. In this paper, we present a solution that was designed using in-lining approach to deliver a middleware that acts as an insulator for hiding the internal workings of the asset tracking system prototype by providing homogenous and abstract environment to the highest layers.

II. SYSTEM OPERATION

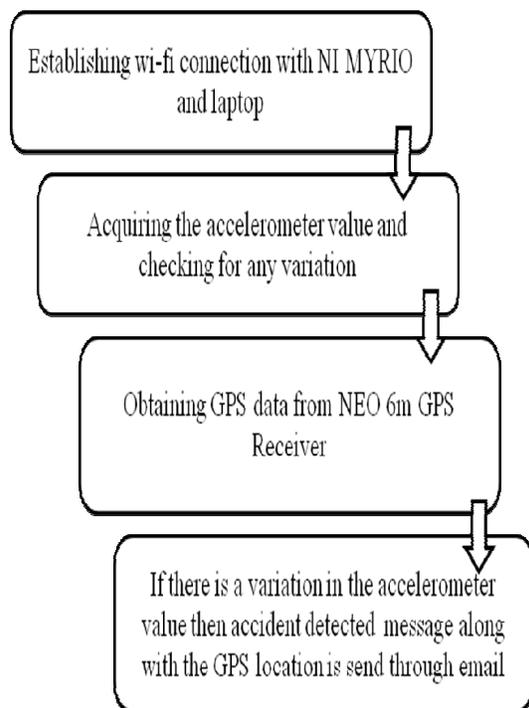


Fig.1 Flowchart of operation

The operation of this paper is well explained using the flow chart of operation and representation in block diagram. The flow chart described below in figure 1, illustrates the interfacing of real world signal with the virtual environment LabVIEW. GPS data which is the latitude and longitude data is acquired with the help UBLOX Neo-6m GPS receiver. The acquired pulse rate signal is sent to NI MyRIO with the help of analog pins in the NI MyRIO. Then, the MyRIO is connected to a PC installed with LabVIEW 2017 software. The analog input express VI is connected with an indicator to display the GPS data on the front panel. The output GPS data is sent to the mobile. This is done by configuring a wifi connection between the MyRIO and laptop along with enabling wifi on the mobile. The output GPS values are send over the mail.

III. SOFTWARE - LabVIEW

LabVIEW is the software that is used in implementing the project. LabVIEW (Laboratory Virtual Instrumentation Engineering Workbench) was developed by National Instruments. LabVIEW is a graphical programming language which is extremely supportive for engineering and research field. LabVIEW is a graphical programming language that uses icons instead of lines of text to create applications. LabVIEW programs or codes are called Virtual Instruments or VIs. LabVIEW is commonly used for data acquisition, instrument control, and industrial automation on a variety of platforms including Microsoft Windows, various versions of UNIX, Linux, and Mac OS X. This platform is largely helpful to resolve complex problems and also comfortable with data flow execution. This will support to work with data types like arrays and clusters and also the loops and structures. LabVIEW environment having front panel and block diagram is used to create a program in virtual instrumentation field. In addition to that, tools palette and finding functions are also present in this software. This will also support the audio input and audio output. It is a programming language used to automate testing and data

gathering. The graphical approach also allows nonprogrammers to build programs by dragging and dropping virtual representations of lab equipment with which they are already familiar.



Fig.2 LabVIEW 2017 logo

IV. HARDWARE SETUP

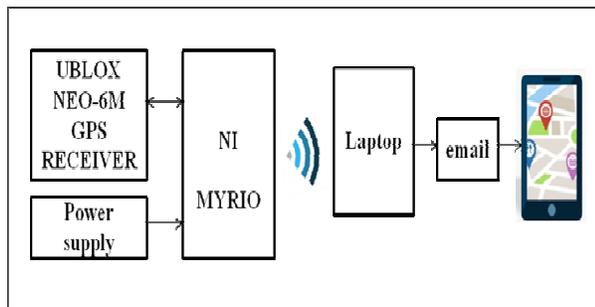


Fig.3 Block Diagram of the Hardware setup

The system consists of NI MyRIO, and a GPS Receiver. The GPS Receiver will gather its geographical location periodically through the satellite tracking system, in terms of the latitude and longitude values, and send it to the NI MyRIO. The GPS Receiver is interfaced with the MyRIO using the UART protocol. The GPS Receiver when connected to the satellite sends the NMEA sentences through the transmitter pin to the Receiver pin of the MyRIO. The LabVIEW program for acquiring the GPS Receiver data from the MyRIO is developed. The LabVIEW program enables us to display the latitude and longitude values. The MyRIO is powered using the battery. The MyRIO acquires all the sensor data and sends the data over Wi-Fi connection. The acquired sensor data are sent through the email .

A. USING NI MYRIO INTO THE APPLICATION

NI myRIO 1900 is a moveable reconfigurable I/O tool which is able to acquire and generate signals using a variety of communication protocols. NI myRIO programming environment permits

reliable communication between hardware and software elements. NI myRIO interfaces with external devices using analog and digital pins or by various communication protocols: UART, I²C. The proposed model use NI myRIO for acquiring the sensor data and transmits the data over Wi-Fi to a mobile phone.



Fig.4 National Instruments MyRIO

B. ACCIDENT DETECTION SYSTEM USING MYRIO ACCELEROMETER

The NI myRIO-1900 contains a three-axis onboard accelerometer. The accelerometer samples each axis continuously and updates a readable register with the result. It has a range of ± 8 g and resolution of 12 bits. The Sample rate is 800 S/s. The fig.5 displays the onboard accelerometer of NI MyRIO.

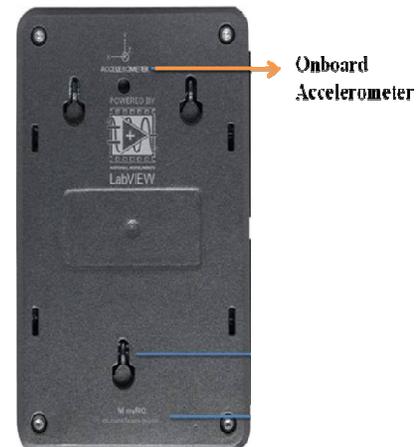


Fig.5 Onboard Accelerometer of MyRIO

In this work, the variation in the accelerometer value is obtained with help of LabVIEW code. The

onboard accelerometer gives values of three axis x,y and z. The obtained values of the accelerometer is compared with the values when the freight moves without any vibration. When the x, y and z axis is compared and if there is variation in the values then accident detected message is displayed.

[p'

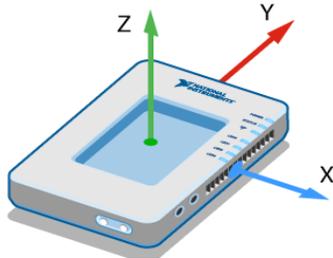


Fig.6 X,Y,Z Axis of Accelerometer

The fig.6 displays the x, y and z axis of the accelerometer. The variation of this axis value is used for the detecting occurrence of the accident. The fig 7 displays the node for acquiring the accelerometer values.

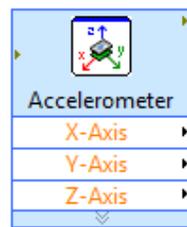


Fig.7 Accelerometer Node

C. GPS COMMUNICATION

The UBLOX NEO-6m GPS Receiver which can add satellite positioning accuracy to any embedded system. The GPS module communicates via UART(Universal Asynchronous Receiver Transmitter) using 2-wire.It can be controlled by the Radio Technical commission for the Maritime services. The interface operates at a default baud rate of 9.6 kBd,8 data bits no parity and with single stop bits. The GPS Receiver uses sentences based on National Marine Electronics Association (NMEA) Protocols for data output. The NMEA sentence is a standard data format supported by GPS manufacturers. The NEO-6M has only one blinking output and that is the Time Pulse pin,

which will be activated only if the unit is locked on to GPS satellites.

Each NMEA message begins with a (\$) dollar sign. The next five characters are the talker ID and arrival alarm. The \$GNGGA is the basic GPS NMEA message, that provides 3D location and accuracy data. The device is connected to RX and TX pins of the NI MyRIO controller. The \$GNGGA message gives information about the latitude and longitude.

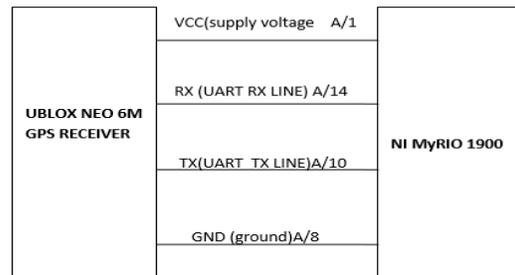


Fig.8 GPS module connection to NI MyRIO

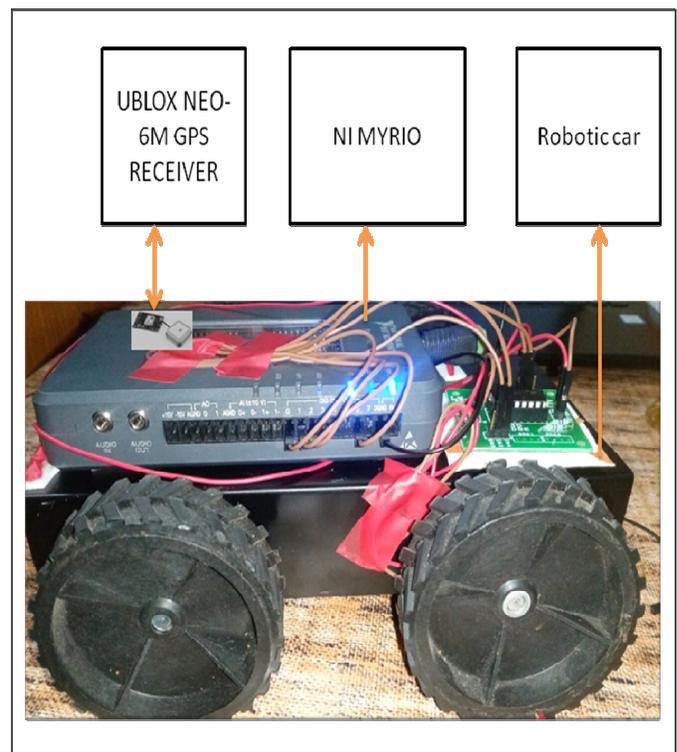


Fig.9 Schematic of Hardware setup

The fig.9 displays the schematic of the hardware setup. The setup consists of NI MyRIO for acquiring the sensor values. The MyRIO is connected to the GPS receiver for acquiring the position of the freight. The latitude and longitude values are obtained and displayed using the LabVIEW code. The onboard accelerometer of the myRIO is used for detecting if the accident has occurred or not. The accelerometer gives information about 3 axis x, y and z. If there is any variation in the movement of the freight or if the freight rolls down the accelerometer value will vary. The values are compared with the normal values of the freight movement and the variation of the values indicate the occurrence of accident. When the accident occurs the message is send over the mail along with the location of the freight where the accident occurred. The fig.11 displays the front panel of the mail vi. This has been implemented using the Simple Mail Transfer Protocol (SMTP). This server has been used to connect to gmail account, to send an e-mail using LabVIEW.

The location of the car is given using the GPS receiver. The GPS sensor with the help of LabVIEW code displays the latitude and longitude values. The myrio Accelerometer values are acquired using the LabVIEW code. The value of each axis is compared with normal axis value. When there is deviation of the axis when compared with normal values an alert message is displayed accident detected. The alert message along with the location of the freight is send over the email. The email is send using the SMTP protocol. The Fig.10 displays the front panel of the labVIEW code for the GPS receiver.

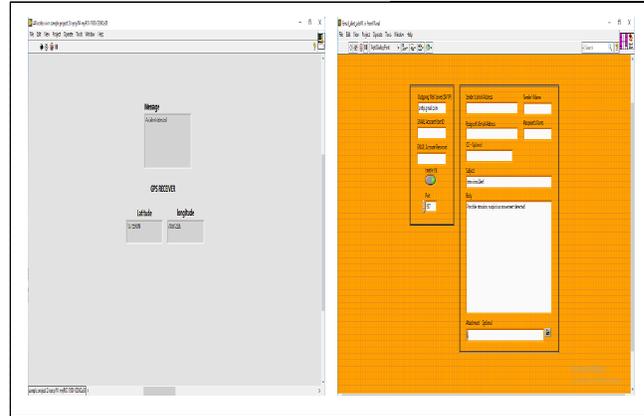


Fig.10 Front panel of mail VI

V. CONCLUSION

An efficient solution for tracking the Asset with the help of GPS receiver is developed. Also any damage to the freight can be detected with the accelerometer sensor. The variation in the sensor values provides information about the accident detected. The detected accident is informed over a mail along with the location of the freight where the accident happens. Thus the accident is automatically informed as a message

ACKNOWLEDGMENT

We thank our mentor and guide Ms. A. Christy Arockia Rani, Assistant Professor, Department of Instrumentation And Control Engineering, for mam's excellent guidance and valuable advice throughout our paper work.

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