Solar Power based Modeling and Monitoring of an Anti-theft luggage system through Smartphone for developing a Smart Society

Suman Kumar Laha, Pradip Kumar Sadhu, Ankur Ganguly, Ashok Kumar Naskar

Abstract*: The stolen of a luggage from any public transport system is a daily basics issue in almost all major areas of any country. So, the security of a packed luggage must be the key concern to all the people in our society while travelling in public transport. This paper will be purposeful to meet those challenges by installing an accelerometer sensor, Bluetooth interfaced to a microcontroller system. The senses of acceleration due to gravity in the X, Y and Z axis will be sensed by the accelerometer and an analog output will be produced by it immediately. For communicating between the system present in the luggage and the Smartphone, Bluetooth will be helpful to text the message alert signal to the owner of the luggage if there is any system violation happened from its last position of the luggage. The overall system power is taken from a solar panel of 11.32V, 0.8A as an input and the output is observed as 6V, .62A.For short range application Bluetooth module application can be useful. In case of long range GPS and GSM facilities can be installed for future benefit. The system will be beneficial to all the people in the society to make a corruption free country in this aspect.

Index Terms*: Solar panel, luggage tracking, microcontroller unit, Bluetooth module, Smartphone application.

I. INTRODUCTION

In the recent times the stolen of luggage are doing at an incredible rate all over the world. If somebody is unconscious about his or her luggage in any public transport, it may possible that their assets may be stolen. Basically in that situation the proprietor will only be able to understand the asset has been stolen when it is already out of sight. In view of the above a clear tendency designates that the users are looking for an anti-theft luggage system which is not only going to accomplish to guard the assets but it can also be able to avoid the money loss. The situation can only be overcome if the subscriber is being informed in real time and particulars of incidence are captured in the controlled system installed in the owner's smartphone [1-3]. A bunch of individuals have initialized to use the robbery control system attached in their luggage but the market accessible anti-theft luggage alarming system is expensive and life span of the system is short too. In this article a modest and finest attempt has been designed and developed with a cheap and low cost luggage theft control system with a microcontroller unit. The system contains a microcontroller and a smartphone for this purpose. [4-7]. This article is designed for implementing the system with a luggage so that if any stolen activity is done, the attached system will automatically provides a sufficient alert message in the owners handset. So that the owner can be cautious before the stolen executed. Parallelly it will help the owner to track the luggage without any physical effort. The article is designed as follows. Section 2 gives a brief summery about the work in this field which has already been carried out in designing the antitheft control system. Section 3 describes the proposed methodology of the system. Section 4 represents the hardware module with results which is used in the system development. In section 5 conclusion shows with different application of the system that how the people of the society are getting benefited by using the system.

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II. RELATED STUDIES

Since many years researchers are trying to enhance the controlling system of an anti-theft luggage system for providing a smart application in this area, a few techniques have been already adopted by different scientists. K.Shruthi et al. describes a model of an anti-theft vehicle monitoring system with a smartphone presentation where the authors have described a modest and cheap vehicle tracking system. The GPS and GSM technology has been used embedding with a smartphone for tracking the portable asset. With the use of smartphone application one can easily track the stolen object by just a clicking a button in the smartphone [8]. S.Lee et al. proposed in their paper a plan and execution of vehicle tracking mechanism with the help of GPS/GSM/GPRS with attaching a smartphone where an effective vehicle monitoring model has been portrayed and executed for tracking the mobile nature of any furnished vehicle. The device is implanted in a vehicle whose location is going to be chased in real time. A microcontroller has been applied there with GPS and GSM/GPRS units. In this projected automobile chasing model GPS unit is used to collect the geographical site in consistent intervals. In their system the GSM/GPRS system is employed to transfer and upgrade the vehicle position into a databank [9]. In manuscript "Design and implementation of real time vehicle tracking system" M. A. Elahi et al,

depicted an authentic vehicle monitoring replica which includes the automobile's site, the apparatus start position and the vehicle accesses situation which spreads the entire message to an isolated server using GSM/GPRS. The communicated message is then displayed on a web built server, integrated with a location on a map. [10]. L Guo et al. depicts a newly model anti-theft prototype, built on wireless sensor characteristic. In their work where the author portrayed a fresh anti-theft structure to monitor interruption which is created on the influence of theft interruption based on the shadowing effect. The stealing intrusion is spotted by identifying irregular RSSI specimen in a wireless connection, associated with a stable range of signal strength with the links normal position. By the anticipated observing method HAS can successfully spot intrusion by keeping it unaffected. In their model, they proposed an organized algorithm to govern the set of links which each node can examine. On the other side to diminish the reply time a dual layer scrutiny clarification with double radio nodes is depicted to examine the surveillance area more accurately [11]. All of the above work which has been done by some of the earlier people have proposed and applied their mechanism mainly on vehicles which is a large object and their device is costlier too. But here the projected system has been implemented comparatively to a smaller object which is basically a luggage which is carried by all the human society in their daily basic in public transport system. That's why the care should be taken much more stringent way.

III. PROPOSED METHODOLOGY

The key feature of this device is to sense the movement of the identified object and informed the master accordingly. In Figure 1 with a block diagram of the whole body is shown where an accelerometer sensor, a bluetooth device, a controller and a solar power system have been installed into the system. For controlling the power, a push to on switch is attached with the system. The controller is programmed in such a way that it can be able to receive the commands from the android mobile phone via bluetooth and can be able to trigger the alarm signals which will be reflected in the android smartphone. At first the luggage will be fixed in any orientation by the master. Then after positioning the luggage a signal will be sent from the smartphone of the master to lock the position of the luggage. The accelerometer sensor data will be recorded as its home position with a threshold of +/- 50 units. If the luggage is moved or shifted from its mother position and the sensor value goes above or below the threshold value, immediately an alarm signal will be sent by the controller to the smartphone connected to it. This will indicate that there is an unwanted movement caused to the luggage and will ask the master to have a check on it. As this device is battery operated, it needs to be powered off when it is not in used mode. Hence a power switch on off is needed but this might allow the thief to turn off the device before lifting the bag. Hence a push to on switch is used to turn on the device where a relay will be used to establish the power connection and will latch the connection even in non-pressed condition. The push to on switch will not allow to turn off the system. Turn off will only be possible from the smartphone of the master with which it is paired off. The overall mechanism has been portrayed by the flow diagram in Figure 2. The circuit diagram which has been shown in Figure 3 is designed in Eagle software platform. The main controlling unit is shown in Figure 4.

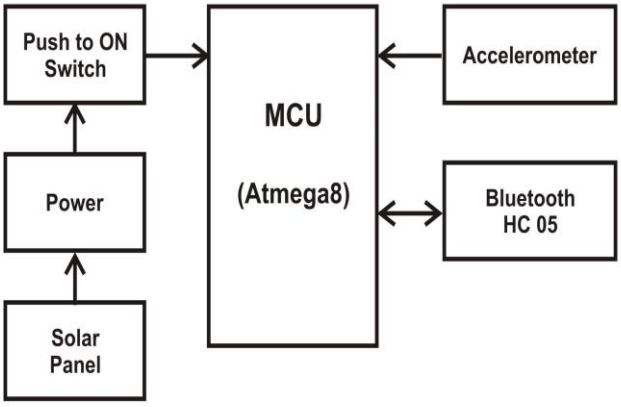

Figure 1. Block diagram of the proposed system

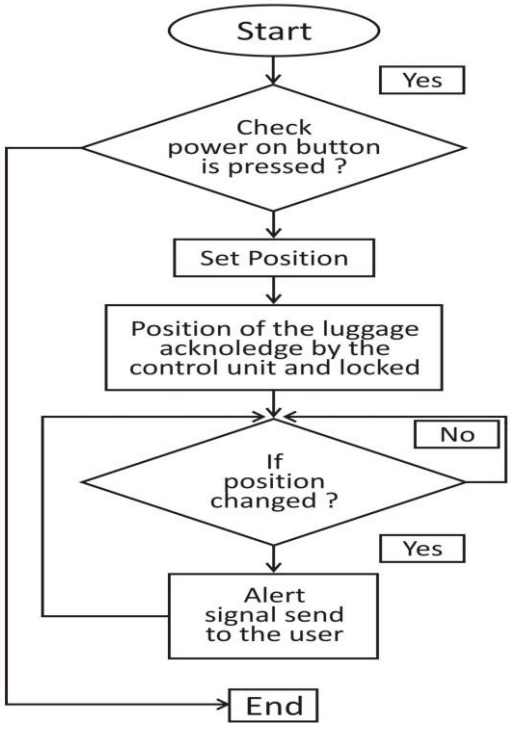

Figure 2. System flow diagram

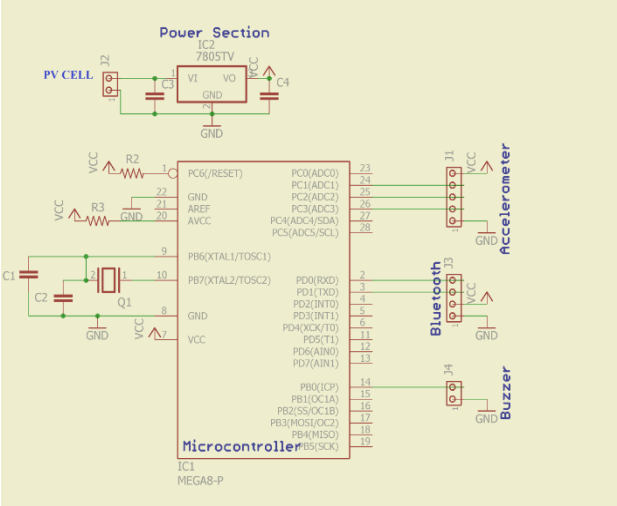

Figure 3. Circuit diagram of the proposed system.

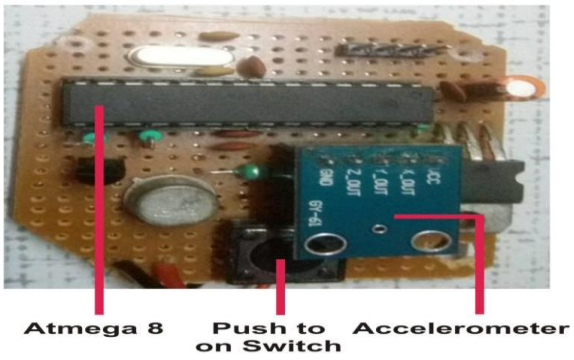

Figure 4. Hardware circuit model of the system.

IV. EXPERIMENTAL SET-UP WITH RESULTS

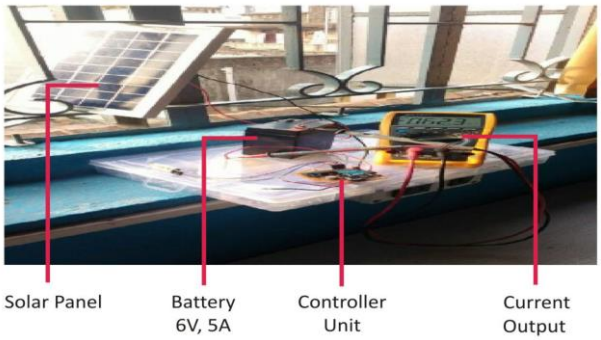

Figure 5. Experimental setup with Solar panel of the hardware module.

In Figure 5, the experimental setup with the Solar panel of 11.32V , 0.8A which is used as an input source to charge the 6 V battery which is shown with the controlling unit. The battery will supply the power to the controller unit to enable the controller and the multimeter is used as to check the functionality of the controlling unit of the device with an current output of 0.62 A. The solar panel is connected in this system to make the system with an intregal part of the renewable energy world as because the world is going in the direction of the non conventional energy source. After verification of the controlling unit through this setup , the system will be ready to be implement into the luggege of the users.

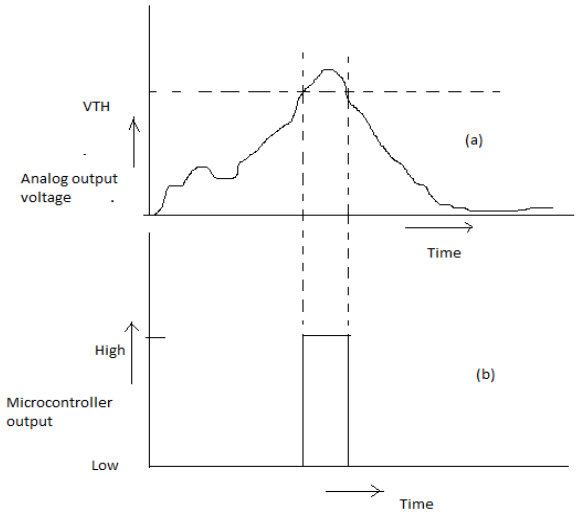

Figure 6. Comparative analysis between the Accelerometer output and the Microcontroller output. (a)Accelerometer analog output signal (b) Microcontroller output signal.

Figure 6 shows the graphical analysis between the accelerometer sensor output and the microcontroller output. In Figure 6(a) analog sensor output voltage levels has been plotted. Accelerometer sensor produces an analog output voltage from 0-5 V. In Figure 6(b) it is shown that the microcontroller output is 'High 'when accelerometer output crosses VTH. VTH is the threshold voltage level as set by microcontroller. Here the threshold voltage level is not fixed. It is a variable factor. The luggage can be positioned by the user in any situation. It may be fixed in vertical direction, may be in horizontal position or any other position. Every time according to the position value, the accelerometer will sense the exact position and direct the data to the operator mobile handset. The operator will immediately fix its last positional value as per his or her choice. If it is moved from the last set position, the buzzer which is attached in the system will ring and the owner of the luggage will be informed.

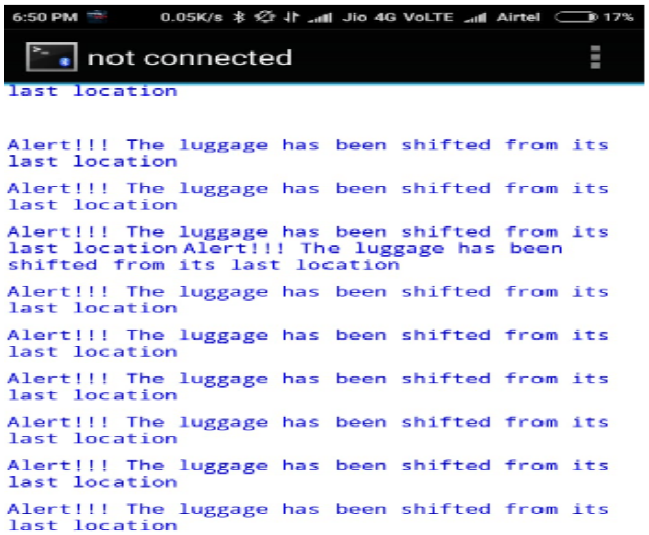

Figure 7. The informed receiving alert signal in the user's handset.

In Figure 7 it is demonstrated with an output which is coming after shifting the luggage from its last positioned with an alert message that "Alert!!! The luggage has been shifted from its last location" in the android handset of the owner.

V. CONCLUSION

The modeling started with the design of an anti-theft luggage system with a microcontroller. The system is successfully designed and implemented on luggage in traditional transport system with bluetooth module for shorter range communication. The depicted system is smart enough to identify the movement of the assets from its original position. The proposal of the motion sensitive system is able to send the motion alert signal to the owner in actual time. This attribute is friendly as well as easy to be used in anti-theft system for effective worth assets surveillance in daily basics. With the help of advance GSM and GPS technology, it can be applied for commercial purpose in future for long distance communication. The modified system can help in managing and monitoring the assets with luggage of the owners continuously. This system is not only going to help in travelling case but it will help to monitor the in house security of the items also. If the device is placed after the main door, through GPS and GSM application, the owner of the house can easily monitor from a long distance that if any theft is going to be taken place in their house or not. In a nutshell this proposed system is effective to build a smart society in wireless communication field.

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