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# Two Wheeler Self-Balanced Security System Design Based on MSP430F5529

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*Abstract- The aim of this paper is to provide smart bike monitoring system that will help in saving human lives and also avoid robbing of vehicles. Any two wheeler vehicles usually cannot balance by itself when it is in rest or running at a lower speed The purpose of this research is to make a vehicle that would be stable by itself in such situations and can be stabilized against any physical impact. Two heavy rotating disks with hub motors have been used here to develop the mechanism of compensating the tilt of the vehicle and get it stabilized. To measure the tilt angle, an MSP430F5529 device has been used and then the angle of tilt has sent to a Bluetooth receiver which is connected with the vehicle. An MSP430F5529 application has been developed which takes the tilt angle as input from its gyroscope and sends data to that receiver accordingly. This MSP430F5529 controls the motor which has been used to control the tilt direction of both of the rotating disks according to the signal This vehicle is designed to provide the safety that two wheeler vehicle does not have during an impact or at zero velocity. The system has three units that comprises of detecting an accident and providing a SMS to the mobile number stored in the memory. It will also give a vehicle tracking system. The Side Stand automation mechanism will provide balance to the user and keep the user secure from the one minute wear and tear.*

*Keywords— MSP430F5529, Two Wheeler, Gyro sensor, Global Positioning System(GPS), Global system for mobile communication(GSM), Anti theft, Sensors.*

## I. INTRODUCTION

Motorbikes are very popular transport around the globe and also in our country. Actually, it is very popular due to its energy efficiency, compact design, convenience and attractive look. In fact, countries like Bangladesh where traffic jam is very crucial issue in daily life, motor bikes are more popular for time consumption. In addition, many youngsters consider it as fashionable ride. However, despite of the features and popularity, motorbike riding is very risky due to its two wheeler unbalanced system. Therefore, motorbike accidents are fatal and very common scenario in our country where an injury is must and death is more frequent scenario [1]. This kind of vehicles is still under research and certainly seems very expensive. The vehicle also has luxury features and still cost effective because we used inexpensive materials those are available in local market. We were inspired by gyroscope mechanism. It's a device for measuring orientation using the principle of angular momentum. The torque applied on the gyroscope is perpendicular to gyroscope's axis of rotation and it is also perpendicular to its angular momentum. This factor causes it to rotate about an axis which is perpendicular to the torque as well as the angular momentum [2]. The objective of building a self-balanced two wheeler vehicle is mainly to ensure safety of the rider. Enormous numbers of people become victim of fatal accidents each year. Moreover, the cars in the cities are increasing day by day but the roads are not increasing. So if a vehicle that can serve like a car but takes less place like motorbike whether for parking or running on roads, would be a better solution for people. With the cabin the rider is safe from impact of thrust and with the self-balancing property of the vehicle; the rider is safe from falling. We also tried to make a compact size vehicle for low power consumption [3]. Till the date there are lots of security anti-thefts system for four wheelers such as central locking system Anti-lock braking system – ABS, EBD, If someone anyhow manages to open the door and tries to start the ignition with master key, the engine gets shut off within 5-10 minutes. But what about the two wheelers do they really have any security system for that? Begin two wheelers greater in number than four wheelers, don't have any security for it. Even at times when someone's bike get stolen he or she simply gives a police complaint and would hope for getting their assets in few

days, but that day never comes, so here a novel, simple and economical system which will make human lives easy and reliable for their valuable assets. Human beings always want to make their lives comfortable by making intelligent system which works faster, very efficiently than humans. This paper can gather the information such as current position of bike through GPS and GSM, in case of an accident by alerting the family member by sending the message on default number saved on chip, thus it would help to inform police or ambulance to reach at accident site so that a person in adverse condition can be saved if possible with the instantaneous first aid help. Another important security which is needed is antitheft which will keep burglars away from our assets being stolen. This system avoids false emergency call in case of safe conditions or sometimes bike may get fall down statically due to any reason or due to improper handling by users thus the vibrations made by piezo-disc does not exceeds its critical value set for detection of an accident [4]. The side stand automation will avoid the accident when user carelessly leaves the side stand in unreleased position while driving and loses balance. When the side stand is left in unreleased position it will give an indication that it is unturned and the user just as to press a switch that will turn the stand connected to the stepper motor and will maintain safer condition [5].

## II. LITERATURE SURVEY

Two wheeler anti-theft system has been implemented based on the speed monitoring of the vehicle. RFID tag having owner's information has been monitored by Hall Effect sensor and verifies the data with data base available at central place [1]. Two-wheeler have some different dynamic characteristics. They are statically unstable but the roll instability disappears as the forward speed increases. A simplified model has been considered to analyze the effects of forward speed and braking force on the roll instability during cornering of a two-wheeler. It helps to understand some important concepts about a two-wheeler negotiating a turn under applied braking force. One method of establishing the proper lean is counter-steering in which handlebar is turned counter to the desired turn and thus developing a centrifugal torque that leans the two-wheeler appropriately [2]. Author has interested in implementing a methodology of specific tool for assessing motorcyclists. As per the authors view research on the acceptability of assistive system for improving the safety of powered two-wheelers (PTWs) is a pressing issue and hence importance to implement a methodology has been given [3].GSM and GPS technology are used. Two-wheeler position is obtained by GPS module this data is given to microcontroller hardware which sends message to user mobile phone through GSM module [7].System alerting owner by SMS to user whenever theft attempt, allowing user to control vehicle remotely by SMS also provide engine immobility and alarm [8].Hardware is implemented to prevent theft from stealing vehicles and fuel of vehicle. About an theft attempt owner is alerted by SMS allowing user to control system remotely [9].Proposed design uses Global Positioning system (GPS) and Global system mobile communication (GSM). System constantly watches a moving vehicle through GPS and sends data when demanded. About a theft attempt, we have to send SMS to the microcontroller, then microcontroller issue the control signals to stop the engine motor. Then we have to reset the password and restart the vehicle [10].

## III. PROPOSED SYSTEM MODEL AND METHODOLOGY

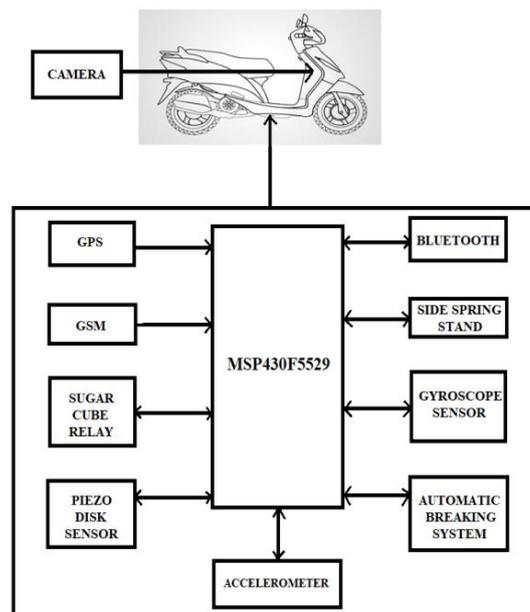


Fig 1: Block Diagram of Proposed system

The aim of this project is to make a vehicle that would be stable by itself in situations such as certain angle of tilt in the vehicle and can be stabilized against any physical impact. There is neither security or antitheft provisions nor any instantaneous medical help providing mechanism for two wheeler users when an accident occurs. To solve these problems we are developing this project, which is necessary to provide a intelligent vehicle system that will assist to save human life and also prevent the stealing of vehicles. Here, two heavy rotating disks with hub motors have been used to develop the mechanism of compensating the tilt of the vehicle and make it stabilized. An android device is used to measure the tilt angle, which is sent to a Bluetooth receiver which is in turn connected to the vehicle. An android application has been developed which takes the tilt angle as input from its gyroscope and sends data to that receiver accordingly. The MSP430 Microcontroller controls the motor which controls the tilt direction of both of the rotating disks according to the signal and we are installing the GPS with the speed governor system to control the accidents by setting up speed limits by two level, they are within the city limits and out of the city limits. The Side Stand automation system will provide the user with a balance and maintain the user safe from the accident. The system has three units that comprises of detecting an accident and providing a SMS to the mobile number stored in the memory. It will also give a vehicle tracking system that will give position and a wireless remote that will control on/off mechanism of the bike.

#### IV. ALGORITHM AND FLOWCHART

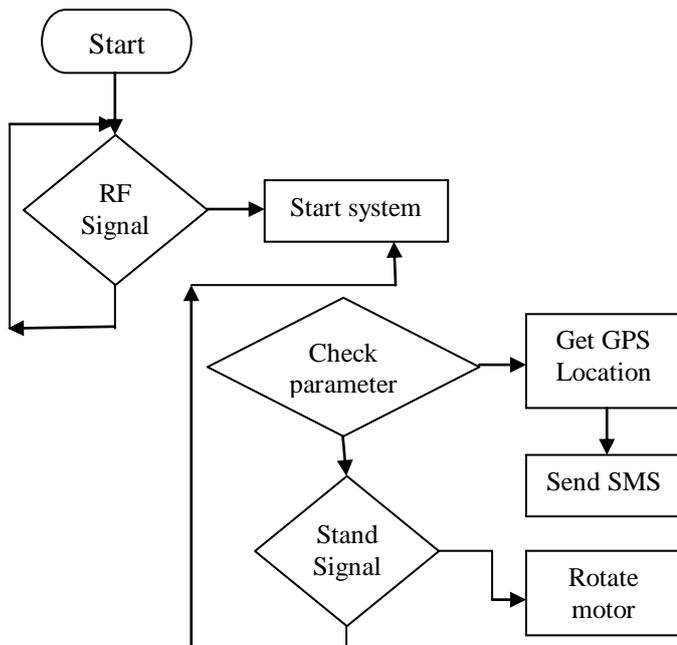


Fig 2: Flow chart of security system

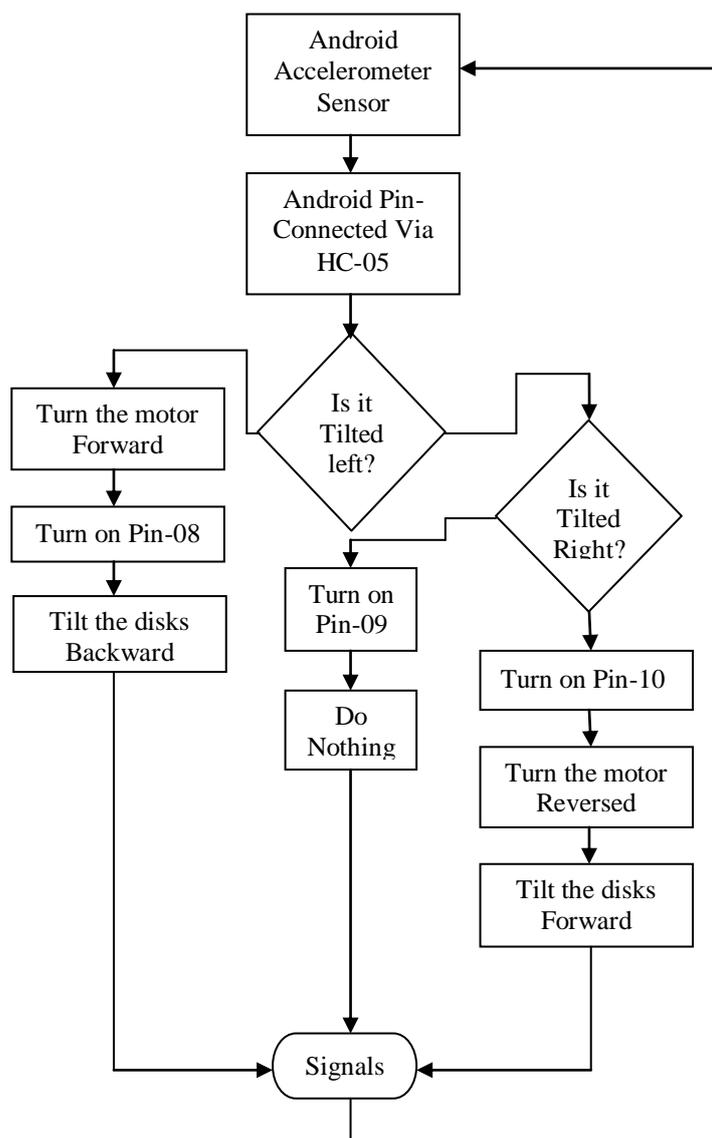


Fig 3: Flow chart of total working procedure

The proposed system has the following applications

- Search the bike in a huge parking lot.
- If somebody try to move/lift the bike.
- If somebody try to ON ignition using duplicate/fake key.
- Gyroscope stabilization concept can be used in two-wheelers for advanced stability and safety for safer transportation.
- Automatic Breaking System is used to avoid collision and accidents in two-wheeler.
- Accelerometers are used to detect and monitor vibration in rotating machinery.
- Accelerometers are components if inertial navigation systems for aircraft and missiles.

The Proposed System has the following advantages and disadvantage

- We can reduce the speed limit of the two-wheeler in Local areas and in Highways.
- We can reduce the accidents.
- We can reduce the rash driving.
- We can avoid the skidding of the vehicle in muddy road.
- We can track the vehicle very easily with GSM and GPS.
- Handicraft people can ride the normal vehicle (whenever they want to stop the two-wheeler or in any emergency case if they press the button side spring wheel will be opened such that they can balance the two-wheeler).

- Side spring stand is used to balance the vehicle.
- Especially it is helpful for women's and old age peoples for balancing the vehicle.
- Sensors are costly.

## V. CONCLUSION

The proposed model many more safety features than existing model which make it more reliable. Safety is one of our top priorities with these vehicles. However, the most important safety feature is our gyro stability system. This will keep the vehicle upright even in a collision, preventing the vehicle from flipping or rolling. It will also be more comfortable than any other motorbikes at the same time will require a very small space of parking. A novel method of vehicle tracking and bike accessing system is implemented to track the theft vehicle by using GPS and GSM technology. The side stand automation is one of the lifesaving mechanisms and it will help to provide comfort to humans. Thus, as soon as the rider meets with an accident the GPS tracks the coordinates and with the help of GSM module the accident detected message is sent to the respected number and by this the valuable life of the rider can be saved which is the main theme of this system.

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