BIKE ANTI-THEFT DEVICE

1. Introduction

1.1. Overview:

Security is the primary concern everywhere and for everyone. Bikes are known for being very fuel efficient and can cut through traffic jams. It saves time and also they are easier and cheaper to maintain than cars. Bikes/Bicycle theft has increased in the developing countries in the recent years. Although, the authorities are said to be doing the best they can to stop these thieves, it still ranks high up in the list of crimes committed in the streets every day. It is a common crime due to the ease of reselling, easy to hide and due to missing number plates, a stolen bicycle is often difficult to search. Bike theft is common in present time and physical protection is not enough. So new technologies are used to protect them from theft. This leads to developing low cost, easy to use solutions to track the bicycle.

The "bike theft detection "is a system designed to protect bikes from being stolen. Bike theft system focuses on two wheelers so that if anyone tries to steal your bike, you are get notified and lets others to know by making loud noise .The project proposes the design of a low cost anti-theft for bikes security based on detection of movement and vibration. There are number of alarm system in the market that are very sensitive which makes many false alarms. In the current system, the vibration sensor or movement sensors are used as a main sensor. False alarm occurs if anyone touches the bike, the alarm triggers easily even though they do not have much sense of stealing. So by doing this project bike anti-theft detectors will reduce false alarms.

1.2. Statement of problem:

Cars have better security systems than bikes such as GPS tracking, send real time alerts, theft detection and ability to shutdown engines remotely. Once a bike gets stolen, users need to go through the nuisance of filing an FIR and collecting the required document from the police station to prove the theft and make a claim against insurance. Through this project we can implement some similar functionalities to bikes. With such a security system user is able to prevent bikes from being stolen.

1.3. Motivation:

System like this are implemented for a long time. Beside from cars, such systems are never implemented on bikes. Due to this bike have become easier target for thieves to steal. Therefore project proposed for providing security system for bike that prevent them from theft. Such a security system can be placed on any kinds of bikes by providing power through external battery.

1.3.1. Benefits:

- Improved Security: A bike anti-theft device can provide an extra layer of security and deter potential thieves from attempting to steal your bike.
- Peace of Mind: With a bike anti-theft device, you can have peace of mind knowing that your bike is protected even when you're not around.
- Reduced Costs: Investing in a bike anti-theft device can help you avoid the costly expense of replacing a stolen bike.
- Increased Convenience: Many bike anti-theft devices are easy to use and can be quickly attached to your bike, providing added convenience and protection.
- Improved Resale Value: Bikes equipped with anti-theft devices are generally more attractive to potential buyers and can have a higher resale value.

1.3.2. Challenges:

- Cost: High-quality anti-theft devices can be expensive, which may make them unaffordable for some cyclists.
- Maintenance: Some anti-theft devices require regular maintenance and upkeep to ensure they remain effective, which can be an additional task for busy cyclists.
- User Error: Bike anti-theft devices require proper installation and use, and failure to do so can result in ineffective protection against theft

2. Literature overview:

Our main motivation for this project is the number of increasing bike thefts in various major cities in India and less recovery rate. In Nashik, 8 in 10 stolen bikes are not recovered in 7 years. Police registered 4,632 cases of vehicle theft and managed to detect only 971 cases, which is mere 20.96, in the last seven years. Similar situation can be found in other major cities like Kolkata, Bangalore. Highest number of bike theft is found in capital Delhi. Statistics shows that there is more need for project such as ours to be implemented at large scale. If not implemented, bike security issue will never be resolved.

Sudharsana Vijayan etal in this paper the authors have laid emphasis on reducing the number of accidents caused by the carelessness of the riders (i.e. driving in a drunken condition or not wearing a helmet while riding a two wheeler). The authors have tried to implement an electronic technique which does not makes it very easy to bypass the basic rule of wearing a helmet & not consuming alcohol while riding. The authors have designed a system which checks two conditions before turning ON the ignition of the bike.

It includes an alcohol sensor (MQ3) and a helmet sensing switch which is used to detect whether the biker is wearing helmet or not. Alcohol sensor is used to detect whether the biker is drunk or not. The output of these two checks are fed to the microcontroller if both the checks give digital 1 the bike gets its ignition ON, if both or any one of the checks fail to give digital 1 there is no ignition. The surface of the sensor is sensitive to various alcoholic concentrations. It detects the alcohol from the rider's breath; the resistance value drops leads to change in voltage (Temperature variation occurs).Generally the illegal consumption of alcohol during driving is 0.08mg/L as per the government act. Except for demonstration purpose, we have a tendency to program the drink limit as 0.04 mg/L. An ear lobe detector sense that is fitted with the helmet unit senses the blood flow within the ear lobe region. So the wearing of helmet is confirmed by our system and similarly alcohol sensor fitted in the mouth piece of the helmet.

Manjesh N etal the authors have proposed a model for the accident prevention which states when the system is switched on, LED will be ON indicating that power is supplied to the circuit. The RF is used to start the two wheeler firstly it check whether the driver is drunken or not if drunken it will not allow to start two wheeler .The small voltage of ignition of the two wheeler is grounded. In normal condition when the helmet is used the pressure sensor is senses pressure and the RF transmitter radiates the FM modulated Signal.

The RF receiver is connected with the two wheeler which is receive the radiated signal and activate the relay. The relay is remove the ignition wire from the ground and connected with the starter switch now the two wheeler will start. When driver met with accident vibration sensor sends message to microcontroller. The GPS receives the location of the vehicle that met with an accident and gives the information back. This information will be sent to a mobile number through a message. This message will be received using GSM modem present in the circuit. The message will give the information of longitude and latitude values. Using these values the position of the vehicle can be estimated

Krutika Naidu etal in this the author's tell about how to make two-wheelers secure from theft. The aim of this project is to alert the surroundings and the vehicle owner via buzzer and a text message about the theft of the vehicle. To check the authentication of the rider in this project a Fingerprint Biometric Module is used. If the fingerprint matches with the fingerprint stored then the ignition is turned ON by using a relay and if not then the alerting system comes into an action. There is also a reminder system attached in this project to remind the owner about the necessities and the formalities about the vehicle like air filling, insurance, servicing, etc. using a GSM modem. An LCD display is also attached with the circuit to continuously indicate the status of the vehicle. The hardware used in the project is 89C51 microcontroller, LCD display, MAX 232 for serial communication between microcontroller and the memory, GSM modem and a Buzzer.

Manjesh N etal a smart helmet is an innovative concept which makes two-wheeler driving safer than before. This project focuses on whether the helmet worn or not? , is the rider riding drunk or not? And did he met with any accident? In the project a pressure sensor is used to detect whether the rider is wearing helmet or not and accordingly send the RF signal to the receiver. Similarly an alcohol detector is used to check whether the driver is drunk or not and

do the needful. For the detection of sensor is attached with the helmet which will sense a vibration at the time of accident of the rider and send the location and a text message to the mobile number defined in the memory of the GSM module. The GPS module will send the latitude and the longitude of the driver to the GSM module which will be forwarded through the message to the mobile number. An LCD display is attached also to indicate the messages and present condition of the helmet and the rider. The components used are P89V51RD2 microcontroller, Alcohol detector, LCD display, Pressure sensor, Vibration sensor, Relay, GSM & GPS Module.

3. Software and hardware requirements

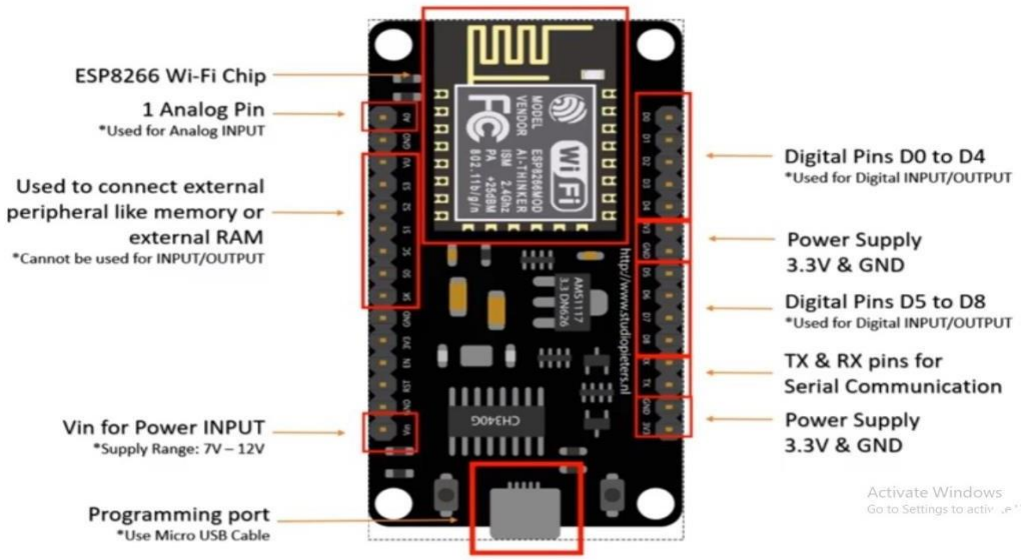
3.1. Software components:

- Arduino IDE.
- Telegram.

3.2. Hardware components:

- Nodemcu ESP8266.
- Vibration sensor sw-18010p.
- Accelerometer adxl335.
- Buzzer.
- LED.
- Jumper.
- Breadboard.

3.2.1. Nodemcu Esp8266:

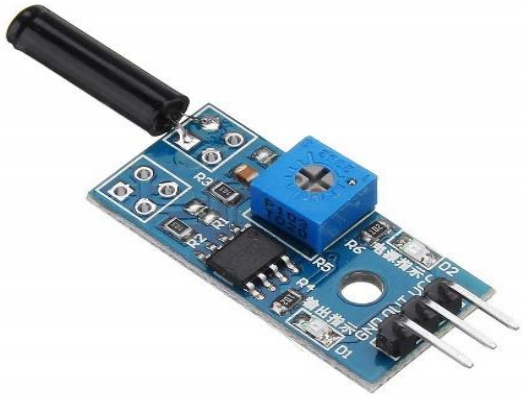


Nodemcu esp8266 wifi module is an open-source, low-cost, low-power MCU (microcontroller unit) development board. It has 17 GPIOpins (11 are Digital I/O pins), out of which one pin is an analog pin, 4 pins support PWM, 2 pairs are for UART (UART0 and UART1), and supports 1x SPI and 1x I2C protocol.

Nodemcu ESP8266 Wi-Fi Module Specifications:

Microcontroller	ESP-8266 32-bit
Nodemcu Model	**Amica**(official)
Clock Speed	80-160 MHz
USB **to Serial**	**CP2102**
USB Connector	Micro USB
Operating Voltage	3.3V
Input Voltage	4.5V-10V
Flash Memory/SRAM	4 MB / 128 KB
GPIO Pins	17
Digital I/O Pins	11
Analog In Pins	1
PWM Pins	4
ADC Range	0-3.3V
UART/SPI/I2C	2 / 1 / 1
WiFi Built-In	802.11 b/g/n
Temperature Range	-40C – 125C

3.2.2. Vibration sensor:



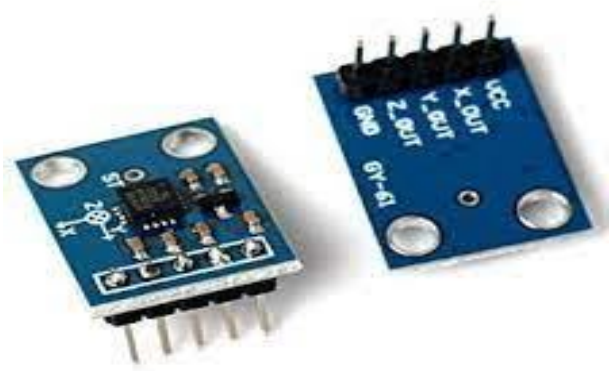
The SW-18010P sensor is used to detect vibration. The sensor has a small spring inside a metal tube. When the sensor vibrates, the spring hits the metal tube and the sensor will be activated.

This sensor has two digital and analog outputs. When the sensor vibrates, the digital output changes from HIGH to LOW and the analog output changes from 1023 to 0.

This Module has 4 pins:

- **VCC**: Module power supply – 3.3V to 5V
- **GND**: Ground
- **D0**: Digital Output
- **A0:** Analog Output

3.2.3. Accelerometer sensor:



ADXL335 is a Breakout board based on 3 axis ADXL335 IC from Analog Devices. The Accelerometer Module require no external devices and works on 5V power supply. It can be directly interfaced to ADC of a microcontroller without any external components.

This module can be used to sense motion or tilt (in case of non-moving) in 3 axis. This is the latest in a long, proven line of Analog Sensors- the holy grail of accelerometers. The ADXL335 is a triple axis MEMS accelerometer with extremely low noise and power consumption - only 320uA! The sensor has a full sensing range of +/-3g the burst echo to return to the sensor. By measuring the echo pulse width, the distance to target can easily be calculated.

Applications of ADXL335:

- Cost sensitive, low power, motion- and tilt-sensing applications.
- Mobile devices.
- Gaming systems.
- DIY projects requiring orientation information.

3.2.4. Buzzer:

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally,it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

A buzzer is an efficient component to include the features of sound inour system or project. It is an extremely small & solid two-pin device thus it can be simply utilized on breadboard or PCB. So in mostapplications, this component is widely used.

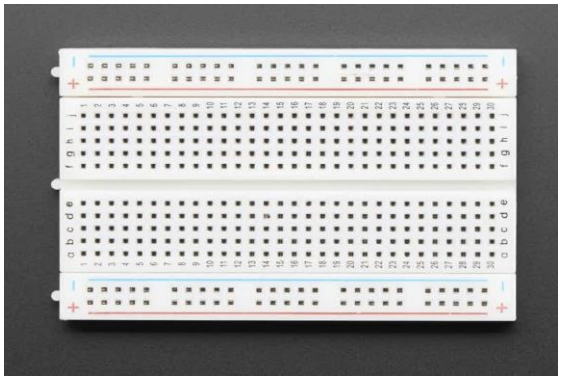
3.2.5. LED:

A light-emitting diode (LED) is a semiconductor light source that emitslight when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gapof the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

LEDs (Light Emitting Diodes) are the latest development in the lightingindustry. Made popular by their efficiency, range of color, and long lifespan, LED lights are ideal for numerous applications, including nightlighting, art lighting, and outdoor lighting. These lights are also commonly used in electronics and automotive industries, signage, andmany other uses.

3.2.6. Breadboard:



A breadboard is a solder less construction base used for developing anelectronic circuit and wiring for projects with microcontroller boards like Arduino. As common as it seems, it may be daunting when first getting started with using one.

A breadboard consists of two areas called strips, and are often separated from the middle portion (commonly known as ravine).

- Bus strips are mainly used for power supply connections
- Terminal strips are mainly used for electrical components
- Each strip consist of 5 pinholes, indicating that you only can connect up to 5 components in one particular section.

The positive and negative signs on both sides of the breadboard are power rails, used to power your circuit by connecting battery pack orexternal power supply
There's no physical difference between positive and negative buses, where labeling is merely for reference and better organization of circuits.

However, as power rails on either side are not connected, you'll needto connect both sides with jumper wires to establish the same powersource on both sides.

3.2.7. Jumper Wires:

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin ateach end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

There are three types of jumper wires:

- Male to Male
- Male to Female
- Female to Female

4. Proposed method:

The proposed system is an bike anti-theft system that makes bike theft almost impossible. Well the owner may now park his bike as intended. Whenever the intruder tries to steel the bike the system will be activated and it makes loud noise to get other people's attention as well as it sends message to the user.

This project bike Anti-theft detector that uses an ESP8266 microcontroller board, various sensors, and the Telegram messaging platform to detect and alert the user of any unauthorized access to their vehicles. The system is designed to detect two types of events: vibration (indicating possible break-in attempt) and movement (indicating possible intrusion).

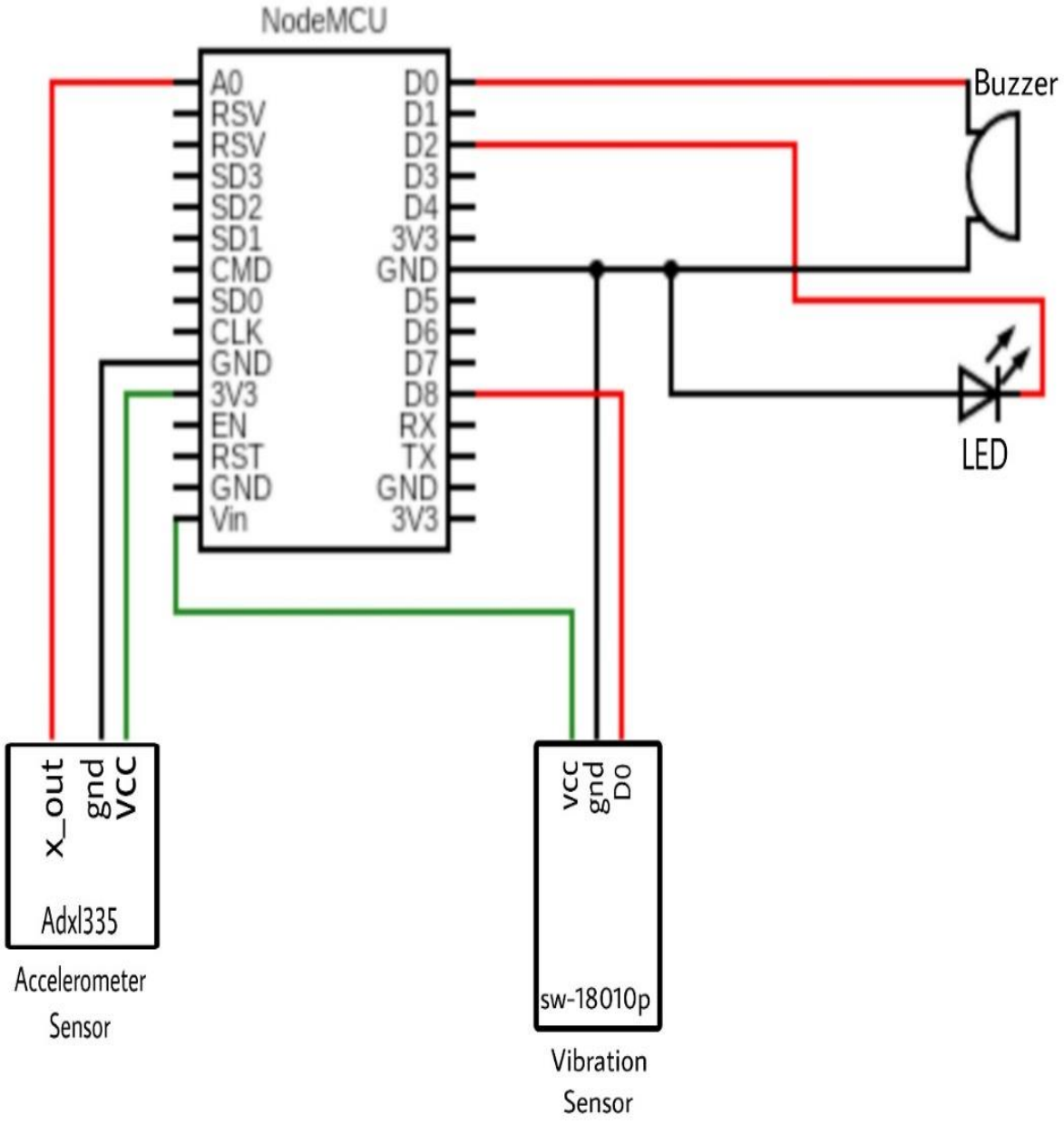
The ESP8266 microcontroller board is programmed to continuously monitor the vibration and moment sensors attached to it. If a vibration is detected, it checks whether it is a false alarm by reading the sensor again. If the vibration persists, the board triggers an alarm by flashing the LED and buzzing the buzzer three times and sends an alert message to the user via the Telegram bot.

If the moment sensor detects any movement, the board triggers an alarm by flashing the LED and buzzing the buzzer once and sends an alert message to the user via the Telegram bot.The user can also remotely activate or deactivate the alarm system using the Telegram bot by sending commands /activate or /deactivate. To enable the system to communicate with the Telegram bot, the program includes the Universal Telegram Bot library, which provides functions to send and receive messages from Telegram. The program also uses the Wi-Fi Client Secure library to establish a secure SSL connection to the Telegram server.

The project requires an internet connection and a Telegram account to receive alerts. It is important to note that while the project can alert the user of possible intrusion, it does not prevent or deter it. It is always recommended to supplement this kind of system with other security measures such as locks, cameras, and monitoring services.

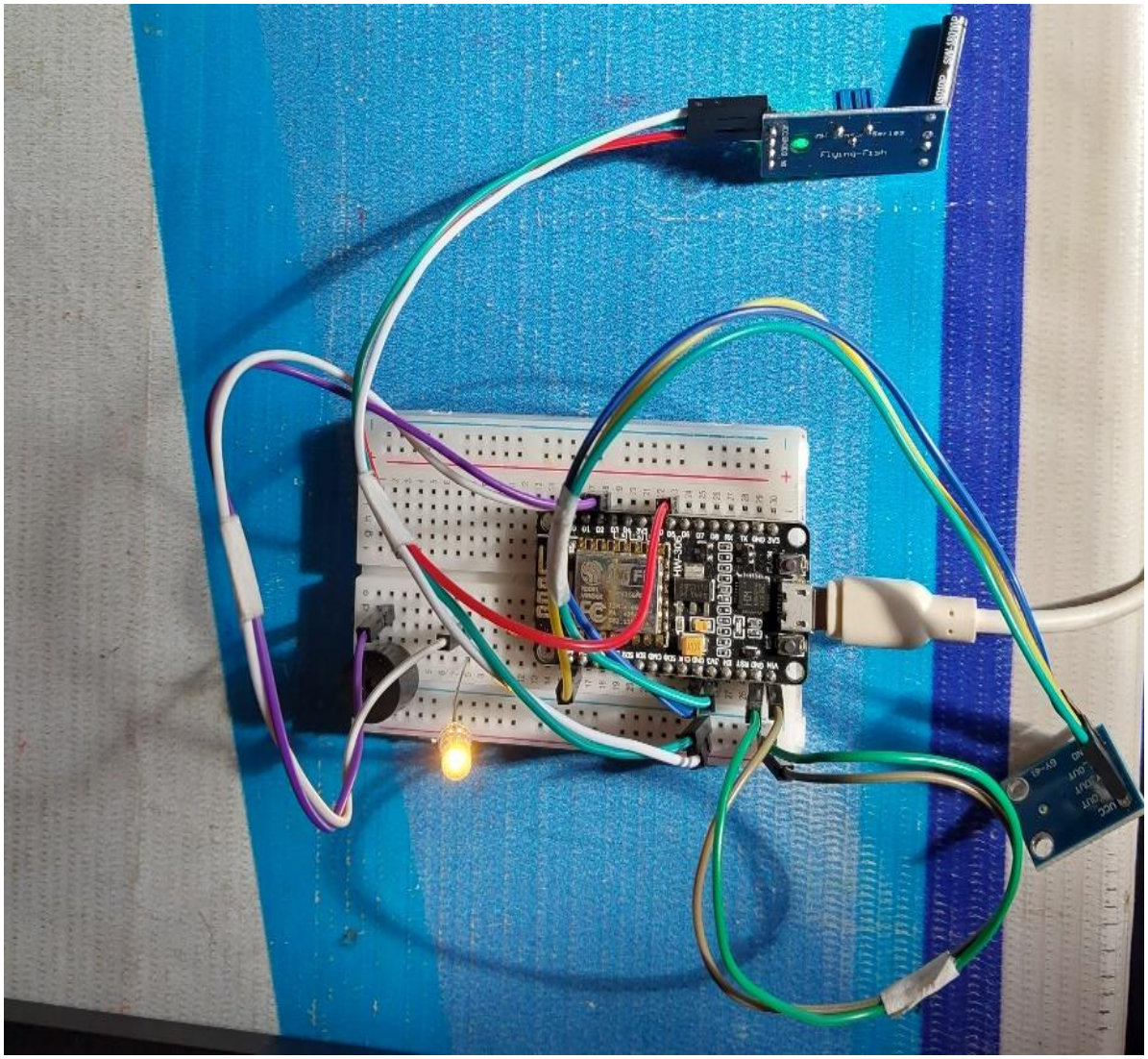
5. Block diagram:

(figure-1.7)



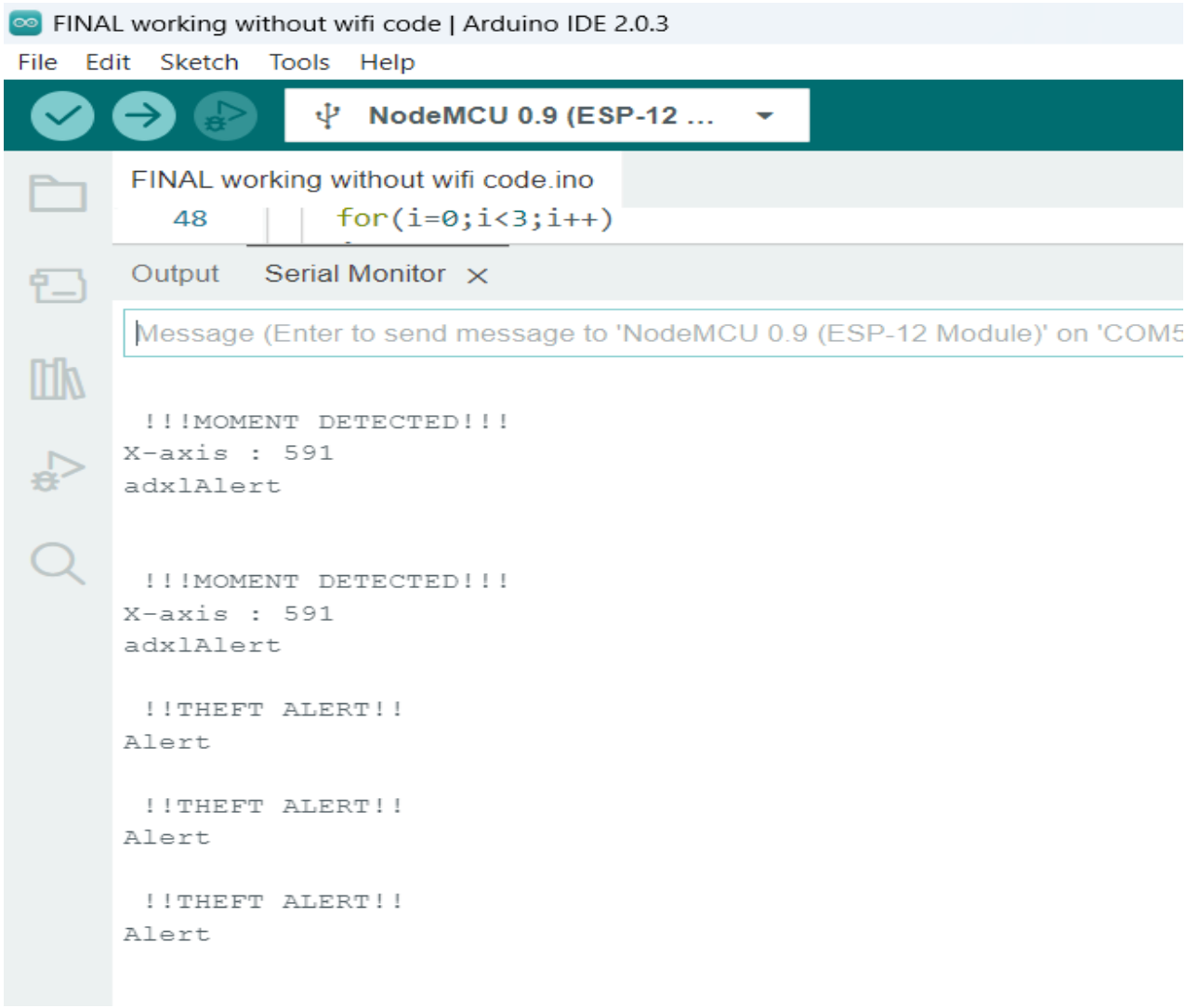
Architecture of proposed system

6. Output:



Working of the project

6.1. Serial monitor:



Output of the project

6.2. Telegram output:

Output of telegram bot

7. CONCLUSION

Our proposed bike theft detector System is the advanced and reliable version of security mechanism for two wheeler vehicles. The proposed security system help to detect the bike theft which reduce the users to go through inconvenience. Proposed bike theft detector can be installed on two wheeler vehicle of any class or company, thereby creating a huge market for the product. . Small size of the module allows it to be placed under the seat of the vehicle, there by needing no physical changes to be done to the vehicle. We believe the frequency of the two wheeler vehicle thefts that are encountered these days could be highly suppressed by installing our bike theft system.

8. FUTURE SCOPE

There are several potential future scope improvements for this anti-bike theft detector project. Here are a few ideas:

Adding GPS: Adding a GPS module to the system can help locate the bike if it is stolen. The system can send the current location of the bike to the owner's phone or email, allowing them to track and recover the stolen bike.

Cloud storage: Storing the data collected by the system in a cloud server can help with data analysis, allowing the owner to identify patterns of suspicious activity and improve the system's accuracy in detecting thef

Machine learning: Incorporating machine learning algorithms can help improve the accuracy of the system in detecting bike theft and reduce the number of false alarms. The system can learn to differentiate between normal bike movements and suspicious activity based on the data collected over time.

Mobile app integration: Developing a mobile app that works in tandem with the anti-theft system can provide a more user-friendly interface for the owner to monitor their bike's security status and receive alerts in real-time.

9. REFERENCES

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