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# Smart Bicycle using IoT

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**ABSTRACT:** Bicycle infatuations with automobile vehicles in roads generally in curved roads and kills thousands of bicyclists with excessive injuries in every year. This fact shows the importance of advancement in conventional vehicle systems. This paper presents a sample model of smart bicycle safety system using Arduino Uno and Arduino Nano. The system contains of hand motion and push button to show turn direction of rider, sends messages along with current location if rider is in trouble and shows if it is safe to take a turn or not. The system is very cost effective and offers safety and security for riders of bicycle, other low-end vehicles and it detects the Obstacles and gives a beep to take particular action.

**KEYWORDS:** Internet of Things, Smart bicycle, Arduino, Android.

## I. INTRODUCTION

In current days, many people are becoming exhausted and disheartened of motor vehicles. As a result, bicycling is becoming mostcommon. But the safety system of this transportation system is not educating. As per the League of American Bicyclists, in 2007, 698 cyclists faced more injuries, also, 43,000 cyclists got injured in accident including motor bike. Most of the bicycle accidents happen in daylight with the peak hours, 8:00 to 9:00 am and 3.00 to 6.00 pm; cycling misadventures oblivious will probably be mortal. Buses and other vehicles are always in hurry and it has brought up the issue of security of low-end vehicles like bicycle. Main reasons for road accident are failure to look, crossing roads, taking wrong turn, so fast motor vehicles. Also, tracking the location can increase accessibility of services and it is significant for providing high quality services.

In this system, there is a light indication for turn but no option to prepared the rider about the turn safety. A model isprojected with some of features for vehicle safety specially vehicle safety and security. In this system, it has debated that when there is a curve on road and rider has to indicate the direction there will be a headlight which will automatically turn on by sensing the nearby.

In later units, these are discussed: in unit II, background of this system is shown. In unit III, System featuresare shown with explanation. Unit IV contains proposed system and discusses about result. In unit V, Applications and in unit VI Conclusion is given.

## II. BACKGROUND

As the usages of green energy idea are developing, importance of educating transport system is also growing. As a result, bicycle is becoming one of the most vital transport systems. There are some cities in the world where someone can easily use bicycle like as Amsterdam, Barcelona, Berlin, Copenhagen, Paris in Europe and Boulder, Chicago, Davis, Ottawa, Portland, San Francisco in North America, Beijing in Asia, Cape Town, Bogota and Perth in Australia. In a German town named Munster, people use bicycles as their foremost transport system more often (37.8%) than mechanical vehicles (36.4%). Even though people are focusing on bicycle, still there are a lot of accident occurs around the world. Traffic-related accident aregrowing day by day especially children are main losses. Over 85% accident occurs with motor vehicles and bicycle.

Because of these truths, to decrease bicycle accident many ideas are taken to increase safe bicycle system like riding behaviour, helmet observance and avoid danger situations. As a result, usages of helmet are increasing rapidly. This paper emphases on a system which ensures riders safety.

### III. SYSTEM FEATURES

#### 1. To detect Obstacles-

We have designed this module in which there are two hardware's as Ultrasonic sensor, Arduino. We are going to place this module as it can detect any obstacle like any vehicle or animal which comes closer to our bicycle. As soon as any obstacle arrives closed to the module it detects the object and gives an indication by blowing a horn. Heart beats can be measured by MAX30102 sensor. As the user keeps finger on the sensor it displays it's reading on the display.

#### 2. To measure heart beats-

Heart beats can be measured by MAX30102 sensor. As the user keeps finger on the sensor it displays its reading on the display.

#### 3. To measure temperature-

Temperature can be measured by MLX90614ESF-BAA-000-TU-N sensor .It is a non-contact infrared thermometer for use with Arduino which senses the temperature of the user.

#### 4. To detect the speed-

When user is using the system, the speed of the bicycle can be automatically detected and can be displayed in the app.

#### 5. To show real time location-

With the help of GPS, we can detect user's real time location. We can search for our destination and can follow the directions of the map.

#### 6. SOS –

Whenever the user is in any danger or emergency, the app contains one feature as SOS . By just one click the emergency contact will receive a message from the user for the help and also the location of the user will be sent. The architectural design of most commercial smart bicycle systems is based on a centralized IoT architecture in which the application logic is governed by a central entity (deployed in a private cloud). Figure 1 presents

#### 7. Weather Report-

It will show the weather of current location of the rider. This feature will help user to decide when to arrange ride.

#### 8. Cycling events-

Road bicycle racing is the cycle sport discipline of road cycling, held primarily on paved roads. Road racing is the most popular professional form of bicycle racing, in terms of numbers of competitors, events and spectators. It will help to know user about current cycling events.

### IV. PROPOSED SYSTEM

A system architecture is the conceptual model that defines the structure, behaviour, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviours of the system. A system architecture can consist of system components and the sub-systems developed, that will work together to implement the overall system. There have been efforts to formalize languages to describe system architecture, collectively these are called architecture description languages.

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Figure 1. Architecture of Smart Bicycle

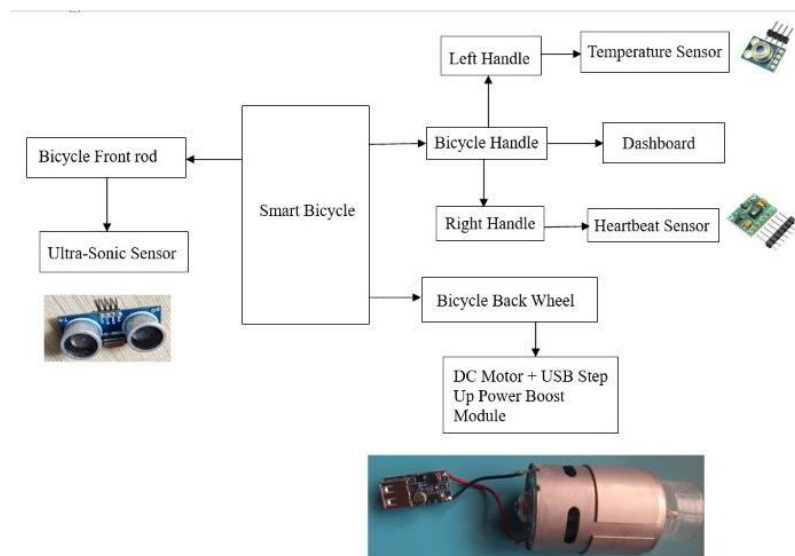


Figure 2. Block Diagram of Smart Bicycle Architecture

A. Software Interface

Following are the three software namely Firebase, Arduino IDE, Android are used alongside with smart locker.

i. Firebase

The Firebase real-time Database is a cloud-hosted database. Data is stored as JSON and synchronized in real-time to every connected client. Instead of typical HTTP requests, the Firebase real-time Database uses data



synchronization every time data changes, any connected device receives that update within milliseconds. The firebase is acting as a server for storing the users details. User can check all the details regarding login Id's and password just by simply logging in to the firebase account. By its real-time database feature, the data gets updated and stored without any consistency related issues.

ii. Arduino IDE

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino IDE is used for programming of hardware like Pulse oximeter, Arduino Nano, Arduino Uno, Temperature sensor, Ultrasonic sensor. This Integrated Development Environment (IDE) provides software interface for working of hardware or sensor. Also, temperature detection, obstacle identification and pulse rate measurement are also implemented with the help of Arduino IDE.

iii. Android

Android is a mobile operating system based on a modified version of the Linux kernel and other open-source software, designed primarily for touchscreen mobile devices such as smartphones and tablets. The Graphical User Interface (GUI) of Smart Bicycle App is designed by using android programming language. The interfaces such as registration and login are for log in and registration to the Android Application to access the Smart Bicycle. Registered user must have to provide mobile number and password in order to log in. If the user is not registered already then, the user must go to the Register tab and register him/her by providing all the required information correctly to proceed further. Once the user has logged in the application, he/she will get access to all the features of the application.

B. Execution

We have added a feature called SOS. If accident happens with the rider, then it will send the message to rider's parents along with his/her location as per below Figure 3.

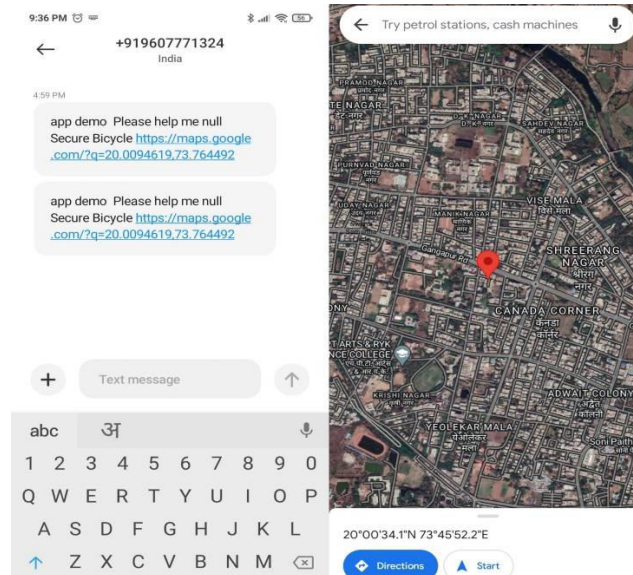


Figure 3. Location link message Figure 4. Location of Rider

After clicking on google maps link it will show Exact location of rider In Figure 4.

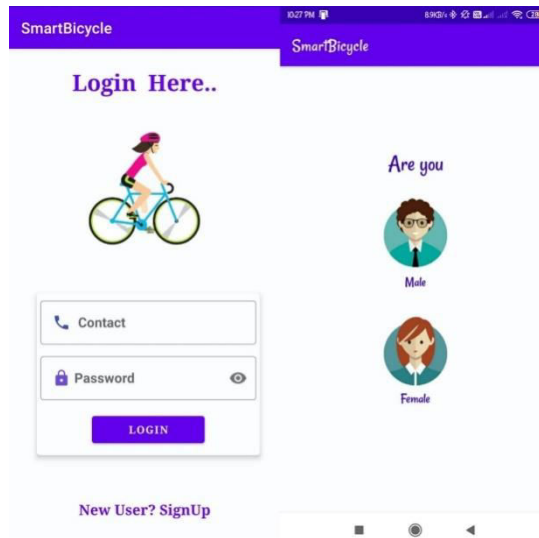


Figure 5. User Login

Figure 6. Login options according to Gender

In figure 5, login option is provided. If you are new user then you have to create account using mobile number, email id. Most important is you have to provide parents number while creating account so that SOS message will get sent to parents.

In figure 6, you need to choose your gender so that application will show the correct sitting position for Male and female.

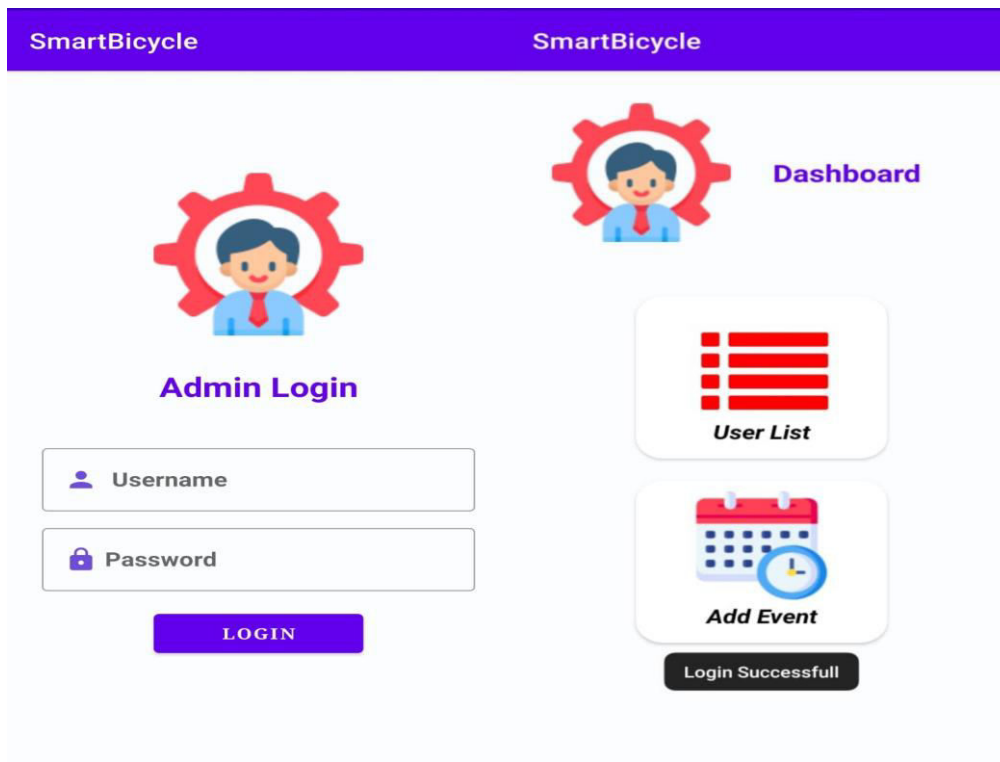


Figure 7. Admin Login

Figure 8. Admin Dashboard

In figure 7, Admin login is provided. As shown in figure 8, admin will manage events as well as be able to see user list.

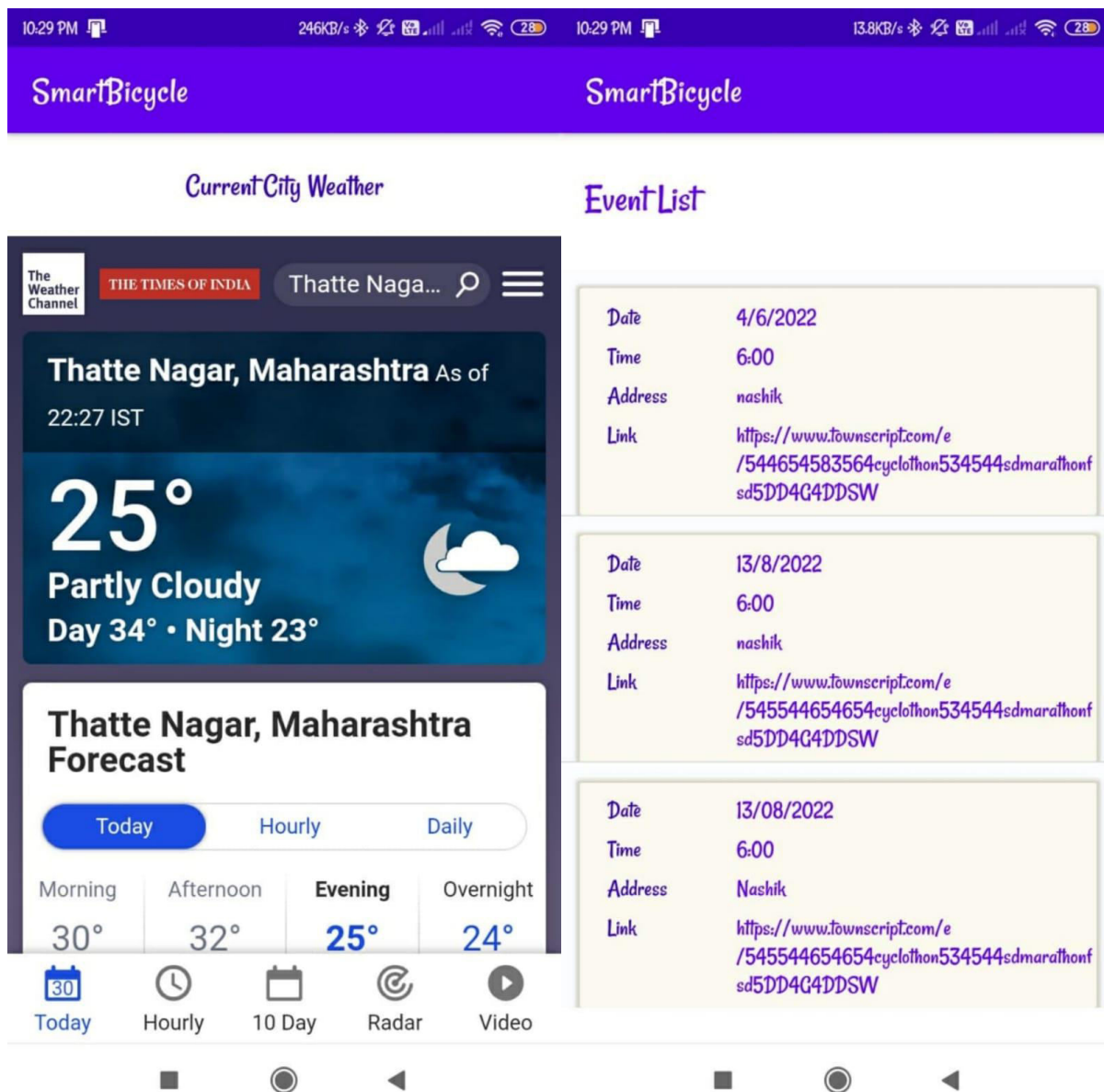


Figure 9. Weather report OF Current Location

Figure 10. Cycling Events

### V. APPLICATION

This system is intensive on rider’s safety with real time tracing. By using this system, rider does not have to rely on any physical program. It will show the heart rate of the rider through heartbeat-MAX30102 sensor. Also, it will measure the temperature of rider. In Bangladesh, most of the people use their hand for turn signal. As a result, this system will help them from facing any damage. Besides, vehicles those are behind bicycle, can easily know which way the rider would go. Also, it is hard and unsafe to look back for vehicles while taking a turn. This system can help rider to notify if there is any vehicle within nearby distance while making a turn. Also, if rider is in any kind of danger or accident, s/he does not have to worry for anything. S/he can just press the button and this system will send a location link to authorized person. Because of this, rider’s safety is assured.

This system can be used to find stolen or lost bicycle. By using our web application, rider or user can know exact location of vehicle by providing valid email and password. As this system is using cloud for storage, we do not have to think for shortage of storage. Because of this system, the rider's and bicycle safety will be increased.

## VI. CONCLUSION

This paper focuses on to implement a smart bicycle safety system using IoT. In this system, we have used ultrasonic sensor. So that, Rider can take action against obstacle. Temperature sensor is used to measure the temperature of rider so that if rider is tired the she/he can take a rest. Heartbeat sensor will give the reading of heartbeats in bpm (beats per minute) By using SOS module, we are getting location data and sending it to rider's parents. Also is used to detect any collision or accident. This system is very cost effective and bike rider safety is main focus of this system.

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