RFID & FINGER PRINT BASED VEHICLE IGNITION & TOUCH SCREEN BASED GEAR SHIFTING FOR TWO WHEELERS

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INTRODUCTION:
Increasing demands on performance, security, quality and cost are the main challenges for today’s automotive industry. Coming to the security aspect, let us throw some light upon the statistics of automotive theft.

1. In the whole world around 100 million vehicles are stolen per year.
2. According to Forbes in USA 40% of the vehicles are stolen using clone keys.
3. Only in Delhi on an average 42 Bikes are stolen per day, among whose 17 are using duplicate keys.

Table 1.1 Number of stolen vehicles in major cities of India (Half yearly) [1]

<table>
<thead>
<tr>
<th>City</th>
<th>Two-wheelers</th>
<th>Motor cars/Jeeps</th>
<th>Buses</th>
<th>Trucks</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sales (R)</td>
<td>Recovered (R)</td>
<td>S (R)</td>
<td>R (R)</td>
<td>S (R)</td>
<td>R (R)</td>
</tr>
<tr>
<td>Delhi</td>
<td>8,171</td>
<td>1,938</td>
<td>4,538</td>
<td>709</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Mumbai</td>
<td>2,460</td>
<td>720</td>
<td>1,307</td>
<td>248</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td>Kolkata</td>
<td>518</td>
<td>82</td>
<td>116</td>
<td>68</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Chennai</td>
<td>166</td>
<td>152</td>
<td>60</td>
<td>37</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Bangalore</td>
<td>4,615</td>
<td>1,142</td>
<td>383</td>
<td>139</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>1,183</td>
<td>300</td>
<td>121</td>
<td>23</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 1.1 clearly shows that keys are not doing their job up to the mark. To enhance the security and to avoid the problem of forgetting keys, owner identification is the best solution to the problem. Human identification has undergone rapid changes with time. An important and very reliable human identification method is fingerprint identification. Fingerprint of every person is unique. So this helps in identifying a person or in improving security of a system. This unique security system is very superior compared to that of the one found in traditional two-wheelers. Let the two-wheelers have this unique security system, which would greatly increase its security compared with traditional keys.

Automotive technology has been developed in many areas, like ABS, active steering system and other control systems, which are implemented to increase the rider’s ease of use and comfort. The development has also concluded the automatic gear shifting, where the rider need not to control gear shifting. But this adds cost to a very high extent and the
traditional two wheelers can’t get the advantage of it. So there is a need for low.

**Evolution of Problem Statement**

**Details of System Component**

The following block diagram (Fig. 2) depicts the system components along with their sub-components.

![System Components Diagram](image)

**Fig1. System Components**

The system mainly consists of two blocks

**Electronics:**

This includes the fingerprint sensor, RFID reader and touchscreen for gathering information of the user. The microcontroller acts as the brain of the whole system. Relay driver boards and Relay system constitute the electronic actuating part that is being connected to mechanical assembly.
Fig. 2 Electronics System Components

**Mechanical:**

The mechanical part consists of solenoids to actuate the gear lever the design of which has been changed to adopt this system.

![Diagram of Electronic System Components](image)

Fig. 1.3 Mechanical System Components

**Gear-Shifter Specifications**

1. Shifter front end length = 142 mm
2. Shifter rear end length = 156 mm
3. Angle to which gear shifter rotated to shift gear = $10^0$
4. Downward movement of front lever of shifter to change gear = 24mm
5. Load required to shift gear at front end of gear = 1.6 to 3.2 kg (Test result)

**Design Constraints**

The various design constraints found are listed below:

1. It should be hand operated
2. Rider should not leave his hand from handle to operate
3. It should work on DC power
4. The vehicle should not be affected during installation
5. System should be rigid
6. Waterproof
7. Weatherproof
8. Operator should not change his eyesight to change gear
9. The system should have compact size.
10. The touch response should be quick
11. The fingerprint scanner system should have sufficient amount of storage to store multiple fingerprints
12. It should be power efficient

**PROBLEM STATEMENT:**

To ignite the engine through a finger print sensor and also with a RFID tag and converting the traditional manually gear shifting mechanism to a semi-automated Electro mechanical gear shifting mechanism by using the hands to give input. The project aims at providing a low cost security and automation system for available vehicles.

**RESULTS:**

**Experimental Analysis of Product**

The analysis of the system that is installed on the bike is carried out and represented as below:

**System Performance**

The Touchscreen based gear shifting system was tested on vehicle for total 2 kms. The vehicle was ridden by 3 riders. The solenoid mounting was not holding the solenoids rigidly. So extra fasteners are used and tested. The overall performance was good but the problem was with touchscreen. The support needed at the back was not rigid enough so it gave incorrect inputs sometime. And there was also issue with sensitivity of touchscreen when gloves were used.

**Overall Performance**

The overall feedback by the riders,
1. Fingerprint and RFID systems are working perfectly.
3. Slightly higher time taken by the solenoid than the required one resulting in a lagged gear shifting.

**Observations in the tests**

1. Heating up of solenoid when on time is more than 8 seconds.
2. Good RFID and fingerprint sensor response
3. Minor issue concerned with the sensitivity of the touchscreen sensor
4. Mechanical issues with solenoids due to lack of lubrication.

**CONCLUSIONS:**

The system is tested under several conditions and worked without any problem. The security system is well designed and self-guided. The system is quite fast to verify and authenticate the specified user within no time. The RFID system is highly stable and considerably fast.

The gear shifting process is governed by the touchscreen whose touch response is moderate although far more sufficient for normal usage. The gear shifting process makes some small noise which is negligible and however beneficial for the user which intimates him indirectly that whether the gear has been changed or not.

**SCOPE FOR FUTURE WORK:**
The scope of the project is listed below:
1. The design can be further developed by using very accurate mounting facility for the touchscreen
2. The automobile can be designed in such a way that all the electronics get embedded in the digital display panel of the vehicle itself.
3. The use of specially designed controller board make the system more secure and more compact reducing its size to around the size of a phone.
4. The project can be further developed into a real-time product which can be mounted on different two wheeler models. By using the specially designed electronics the price of the product may be reduced greatly making it a very economical product.
5. The aesthetics of the product can be upgraded to make it a ready to sell product.
6. The system can be upgraded by incorporating smartphone for fingerprint reading, gear shifting input and controlling of the solenoids.
7. The automated gear shifting may then be upgraded to fully automatic transmission by using some feedbacks from the rear wheel rpm and by eliminating clutch.
8. The system may then be upgraded to make it an IOT product.
9. The performance of the system can be made more reliable by using better quality electronics and some secure, safer, bug less programming.
10. The size of the system may be reduced by using specially designed solenoids.