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Designing and Implementing RFID Technology for Vehicle Tracking in Bangladesh

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Abstract: Vehicle tracking has increased in use over the past few years and, based on current trends, this rise should continue. Tracking offers benefits to both private and public sector individuals, allowing for real-time visibility of vehicles and the ability to receive advanced information regarding legal existence and security status. On a busy road, identifying unregistered vehicles are very tough and troublesome for the authority. In Bangladesh traffic polices do not have any technology that can identify quickly fraud registrations on full roads. Traffic polices gets very late information about illegal vehicles and identifying those is more difficult. The current manual checking is also annoying for legal paper holders. This paper looks at the reality of existing problems of recognition of vehicles by traffic control department of Dhaka– the capital of Bangladesh and a feasibility study to implement RFID technology to solve this.

Keyword: RFID, RF-Reader, RF-Tag, BRTA-IS

1. Introduction
We propose a solution to track down those vehicles easily and management will be able to make more accurate decisions that are directly related to number of vehicles on roads and highways and handling them effectively according to a preplanned policy. In 2003 BRTA (Bangladesh Road Transport Authority) [1] engaged an application to assist them in total overall management, control and supervision of road transport systems in Bangladesh. With this application system in place, BRTA is able to enforce the Bangladesh motor vehicle laws, rules, regulations and policies more effectively. Integration with other local authority such as the Police Department and Road Safety Cell will further enhance and diversify the scope of coverage for BRTA. BRTA-IS (code name of this project) is subdivided into 4 major modules, namely; Vehicle and Driving Information System (VDIS), Human Resource Information System (HRIS), Customer Information System (CSI) and BRTA Web.

2. Existing System
In this current system (no computer system exists at traffic checkpoint):
• Latest report on the hand of traffic police is absent. In case of any report traffic personnel require going to BRTA office to get detail.
• Paper based information may be copied by fraudsters and can run several vehicles with a single registration number, route permit certificate and/or fitness certificates.
• Not easy to verify route permission by a newly appointed traffic personnel.
• Complaints against traffic personnel are very likely, as no proof record is possible to keep by the owner.
• Very tough to stop suspected vehicles as it may hamper other major legal riders.
• Correct information about number of vehicles that are passing in a day through a particular route is hard to measure.
• Papers (Blue book, License, Route Permit & Fitness Certificate): BRTA and traffic police department have been using the traditional techniques of issuing original papers since the starting.
• BRTA and police are now attaching stickers on CNG 3-Wheelers after checking papers. They paste BRTA stickers on every vehicle. Both BRTA and police officials’ informed that the vehicles having no stickers would be considered faulty or illegal and that action would be taken against them.

Finally, keeping the information manually is very complex as they are huge in volume. So, we have tried to find out a solution for this problem.
3. New Interactive System
We may think about Barcode as a solution since some countries’ transport departments are using this technology. But all modern challenges may not be overcome easily. Recently huge improvement has been evolved in printing technology and false driving licenses can be easily generated that are impossible to identify. Therefore papers are not enough to overcome the critical situation and very hard to implement in speedy and busy roads.

![Fig. 1 (a) Results of RFID Zones in Dhaka to considering 10 checkpoints (b) Tracing vehicles using RFID Readers](image)

To overcome above problems it is needed to think something new and cheap and that can be enhanced to meet future demands. The technology must suit and work in busy and rush environment without many disturbances to other legal riders and owners. This technology will help streamline operation of public transport and check violations like not plying on bus lanes, not stopping at bus stops. This will also help track down vehicles involved in crimes or offences. Therefore, the best solution is using Radio Frequency Identification (RFID) Technology. Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. Most RFID tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, and other specialized functions. The second is an antenna for receiving and transmitting the signal.

![RF Tag on Windshield](image)

![RF Reader](image)

Fig. 2 A RFID tag used inside a vehicle for electronic toll collection/ tracking.

There are generally two types of RFID tags: active RFID tags, which contain a battery, and passive RFID tags, which have no battery. Today, RFID is used in enterprise supply chain management to improve the efficiency of inventory tracking and management.

3.1 Challenges with RFID
There are many problems to implement RFID in vehicle tracking in Bangladesh. The following six quantities may raise the obstacle to implement RFID technology:

- The simplest of these tags is more expensive than a printed barcode moreover the potential greater infrastructure capital cost has to be bettered by other benefits in the distribution chain or represent an application for which the barcode is not suitable e.g. Smart Cards.
- There is a high cost (long pay-back) for integrating RFID technology into existing control systems [2].
- External influences such as metalwork, material dielectric properties and radio Interference can constrain RFID remote reading.
- There are currently ranges of RFID application numbering systems, which need unifying to increase uptake. [The International Standard Organization (ISO) and Electronic Product Code (EPC) Global...]

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consortium, amongst others, are working to address this issue.
• Currently there exist no internationally agreed frequencies for RFID operation (other than 13.56 MHz, which is primarily used by smart cards but can also be used by other RFID tags) and permitted scanner/reader powers differ between countries. This limits product take-up. [For example, there are significant differences between the USA and European UHF frequencies].
• Employee Unwillingness: Traffic police are not interested to use automated system because they do not have knowledge about the advantage of Information Technology and they feel comfort to use traditional work system.

3.2 Investment appraisal
The RFID system will earn a lot of government revenue. Many times vehicle’s are not updating its status and going on road. As a result many accident and other problems come out. There are approximately 400,000/- motor vehicles have registered in Dhaka Metropolitan city. Table 1 shows an estimated cost for implementing RFID technology here in Dhaka, Bangladesh.

Table 1. Estimated cost for implementing RFID in Dhaka

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Total (TK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID accessories estimated</td>
<td>15,000,000/-</td>
</tr>
<tr>
<td>for Dhaka city</td>
<td></td>
</tr>
<tr>
<td>Computer accessories</td>
<td>12,000,000/-</td>
</tr>
<tr>
<td>Logistics &amp; Support</td>
<td>6,000,000/-</td>
</tr>
<tr>
<td>Training &amp; HR development</td>
<td>5,000,000/-</td>
</tr>
<tr>
<td>BRTA-IS Up-gradation cost</td>
<td>3,000,000/-</td>
</tr>
<tr>
<td>Total</td>
<td>41,000,000/-</td>
</tr>
</tbody>
</table>

The estimated cost is 41,000,000 for Dhaka city RFID Zones that has considered 10 checkpoints as shown in figure 1(a).

3.3 Implementation
Currently, in Bangladesh, Army has planned to employ RFID technology to track soldiers and visitors entering its Dhaka Cantonment via vehicle or on foot. Deltech has developed and demonstrated a prototype for such a system [3]. Our proposed system is much vast than that one. For the best use the system will take the form of client/server architecture. The following diagram shows this architecture:

![Diagram for RFID integration to BRTA-IS](image)

In operation, the reader’s antenna broadcasts RF energy over an adjustable area called the read zone or reader footprint. The tag on the vehicle reflects a small part of this RF energy back to the antenna, and the reflected radio waves denote the tag's unique identification code and other stored data [3].
The reader then transmits this code to the BRTA’s host system to determine the vehicle’s compliance. The tag-to-reader identification process takes only milliseconds.

There are two privacy concerns regarding RFID, firstly, the owner of a vehicle will not necessarily be aware of the presence of an RFID tag and the tag can be read at a distance without the knowledge of the individual, it becomes possible to gather sensitive data about an individual without consent. Secondly, it would be possible to deduce indirectly the identity of the purchaser by reading the globally unique ID of that vehicle (the RFID tag) [4,5]. We will propose solutions to these problems in future works.

4. Conclusions

In contrast, manual, visual-based identification, tracking, and enforcement systems are labor intensive and expensive. The inefficiencies of those systems can result in significant revenue losses for government agencies. The private sector may be primarily responsible for leading the development and enhancement of technologies which further expand vehicle tracking capabilities. Governments throughout the world can play a role by providing incentives to companies developing tracking alternatives, or mandating the use of certain technologies on all vehicle travel to or within their country.

The project described above demonstrated the viability of the tracking technologies and the cost savings that can accrue through their use. As they progress, more quantifiable information will be available, allowing for Government companies to make more informed decisions regarding vehicle tracking and the associated technologies. Government agencies can automatically detect and screen motor vehicles for compliance with federal, state, and municipal vehicle regulations, as well as process enforcement.

References

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