Tracking Software with Hologram Technology to Secure Goods

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Abstract - *This paper presents a possible system for online shipment and delivery tracking using RFID technology and robust hologram grid system to ensure the security of the goods placed inside the container and protect it against theft. The software aims to track the location of the delivery at every instant of time, i.e., from the time of shipment to delivery, and using a smart hologram technology, to form a lattice grid, increase the accuracy in shipment of the packages as illegal attempt to unload any package would create an alert. So, both the goods and their carrier vehicle are being monitored simultaneously. The database of the system is quite robust and provides useful information about the shipment by simply clicking buttons on the application which is available on both mobile and PC. Actual implementation of the software has not yet been tested but the results of the research show us that the system is promising for online goods tacking.*

***Key Words*: Hologram grid system, RFID technology, delivery tracking, lattice structure**

1. INTRODUCTION

The need of tracking software is of a greater importance for many manufacturing firms nowadays. It is essential for managing logistics network efficiently and ensures high customer satisfaction. Delays in the shipment delivery of even a few days can cause a great loss to these high manufacturing firms. Coordination problems between shipment dealers and third-party receivers causes imbalance in the production department as well as the sales department resulting in poor customer satisfaction. It also breaks the trust in relationships between firms gradually. Hence it is truly important for the third-party receivers to know exactly till where their shipment has reached. Some companies have created great software used in tracking systems, but some limitations such as non-functionality on iOS devices, lack of information displayed in mobile phones, networks issues causing failure in real time display of location. Also, due to minimum security arrangements for the cargo kept on the ports or in trailers or trucks, the risk of theft increases. Cargo theft may cause loss of about billions to the manufacturing firm. Till date no technological advancement has been made to overcome the problem of cargo theft. Without proper and suitable tracking and tracing system, efficient co-ordination of logistic flow would be difficult to acquire. Seeing all the above problems on hand, we have come up with an innovative solution to the tracking systems of the shipment of the goods and along with that ensuring the safety of these goods and ensuring the proper delivery of the goods. Our software aims to solve most of the problems faced during shipment of products by companies and also create a secure application for online order placing and buying or selling. More about the software is mentioned under the "Methodology" section of the Paper.

2. LITERATURE SURVEY

Before developing the software design, we searched a list of firms who were making tracking systems. To understand what we should and what we shouldn't include in our software system, we researched about their tacking systems. We noted down the most common features amongst all the software of the firms. For any product, the most important thing is customer review, and hence we took the reviews of the customer and important part of the research. From there we got to know all the drawbacks the various software was facing. Some of this software are listed below:

i. Teletrac Navman Director
The satellite is used for the vehicle positioning by using satellite GPS. The information is transmitted between the vehicle and the telecommunications company (the security system) via a wireless cellular or device connection. The access to the information about your goods that are been tracked is easy.
Drawbacks:
- Satellite does not work in bad weather. Trackers can be disabled easily by easily disabling antenna.
- There is a lot of backend work that remains a big question mark to the end user.
- The system tablets malfunction on a regular basis.

ii. ClearPath GPS
They are a no-contract company. The customers pay on a subscription basis for their GPS tracking system that can track vehicle location down to 30 second time-intervals. Customers will be able to monitor the driver of the crew at any given time. Large scales and easy to zoom in map were another feature of the software.

Table -1: Literature Survey Table

Sr. No.	Title	Author	Year of Publication	Key Findings
1	SWTRACK: An intelligent model for cargo tracking based on off-the-shelf mobile devices	Rodrigo R.Oliveiraa, Felipe C.Nogueza, Cristiano A.Costaa, Jorge L.Barbosaa, Mario P.Pradob	2013	SWTRACK provides a mechanism to continuously monitor detours in planned routes through Geofence techniques. We created an alerts mechanism that allows sending notifications, in real-time, whenever some predefined situations occur. We provide an impact analysis regarding GPS precision and battery power consumption.
2	An intelligent model for logistics management based on geofencing algorithms and RFID technology	Rodrigo R.OliveiraaIsmael, M.G.CardosoaJorge, L.V.BarbosaaCristian, A.da Costaa, Mario P.Pradob	2015	The proposed model manages travels and cargos, without user interaction. We developed a hardware that obtains context information using RFID technology. The model uses context information and geofencing algorithms to perform decisions. The model sends notifications, speeding decision-making up, and reducing costs.
3	Real Time Shipment Tracking System using RFID	Medhath Awadalla	2018	The developed system comprises database, website, and a user-friendly interface to follow the packages, knowing the status of the packages of being damaged or lost and its location until reaching its proper destination.
4	A scalable real-time tracking and monitoring architecture for logistics and transport in RoRo terminals	Mouna Amrou M'handa, Azedine Boulmakoulb, Hassan Badira, Ahmed Lbathc	2019	The proposed architecture provides a real-time tracking capability. It tracks a vehicle in each area of the terminal through a portal that identifies it using a barcode, a QR-code or a magnetic ID card. The system performs the process logic checking/reasoning and provides process knowledge support. Still, it needs to be tested in order to evaluate its efficiency using a real case study with data.

3. METHODOLOGY

3.1 Flowchart

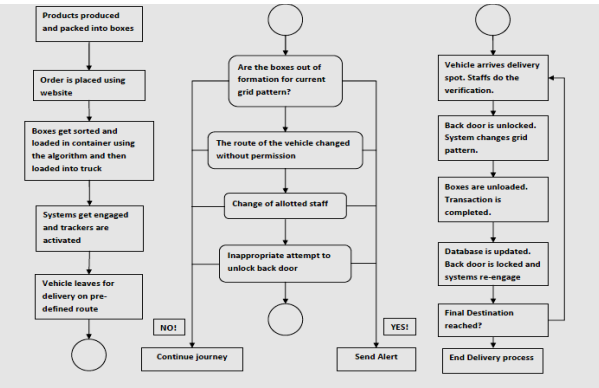

Fig -1: Flowchart

3.2 Implementation

i. Initial Stage

The products are produced and packed into boxes and the boxes are then given reference numbers or specifically the B_id (Box id). The details of the product are uploaded online and are ready to take orders. The customers place their order using the website or mobile application and payment method is selected. The details of the order are then stored in the database along with the details of the customer. After complete procedure of order being placed, the sorting stage initiates.

ii. Sorting Stage

The total product requirement is checked for each area, city or town according to the orders placed and their boxes are collected and grouped. After all the boxes are collected and sorted, they are allotted a vehicle. Huge container vehicles are selected for huge order amount and smaller vehicles like

mini trucks are selected for lesser number of boxes for the area of delivery.

Now, the size of these boxes is checked and the boxes are then sorted again with respect to size. The simulator is then started and the number of boxes according to size is input in the system. Using the Heuristic algorithm, the simulator creates a pattern for loading the boxes into the vehicle/container. This works according to the volume occupied by one box and how they can be stored together to fit in the vehicle/container and form a regular shape as well. Also, the delivery location decides which boxes to be loaded first and which ones to be loaded at the end (If the area of delivery comes first in the route those boxes are loaded at the end when the container is full and vice versa.).

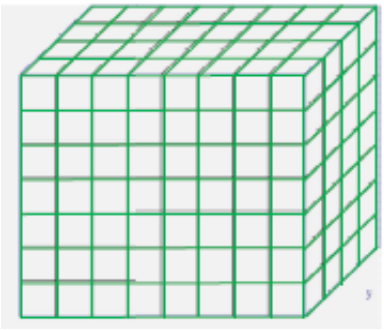

Fig -2: The loading grid created by simulator

After the simulator has created the pattern to load the boxes, the hologram grid is set for that pattern on the simulator. The pattern displays the B_id for each unit the formed volume lattice and grid is formed surrounding it unit in the formed lattice pattern. The boxes are then loaded onto the vehicle according to the set pattern and the hologram grid is activated and locked. By locking, we mean that during this time if any of the package/box is removed from their set position in the grid, the alarm would go off and alerts would be sent to responsible authorities as well the same would be reflected in the simulator. So, after the locking procedure, the doors of the container are locked and tracker of the vehicle is activated.

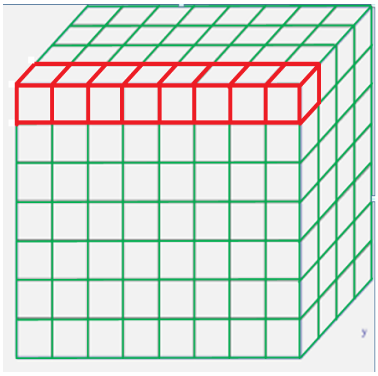

Fig -3: The change in grid color for empty lattice space

The tracker uses the RFID technology for getting the satellite position of the vehicle. The driver/(s) of the vehicle (one or more than one) get seated in the vehicle and go through facial recognition or fingerprint recognition or retinal recognition, as per the type available in the vehicle (Also used for the back door lock). The details of the driver are input in the database along with the vehicle_id they are allotted. The vehicle is now good to go and real time location of the driver can be seen at the customer's end. This leads us to the transportation stage.

iii. Transportation Stage

During the transportation stage all the systems in the vehicle remain engaged while driving (This includes the back door lock and the hologram grid inside the container). The maximum number of halts would be assigned to the driver according to the distance of his route. After each halt taken, the identification of the driver would be asked by the system; if it matches, only then the driver would be allowed to start the vehicle or else alert will be sent if systems are being overridden.

The back door of vehicle remains locked until and unless the delivery spot has arrived and the driver unlocks it using the fingerprint or retinal scan. Any inappropriate attempt to unlock the back door, an alert would be raised (For e.g. If someone tries to unlock using fingerprint and it fails more than 3 times, the system raises alert). Also, the hologram system remains engaged at all times during the travelling and is disabled at delivery spots only by the Fleet Manager. Any attempt to move the cargo during movement would raise alert.

Moreover, the tracker would give the real-time satellite location of the vehicle to the customer as well as the System In-charge. During the time of travel, if there is any congestion observed on the route before reaching that point, then using the satellite imaging the new route is updated to the driver's and the customer's end. But if the driver changes the route on his own, an alert is sent to him to move over and he is questioned by the System In-charge.

Finally, at any point of time, the customer can ask queries about the expected delivery directly to the staff in the vehicle and there is no need to involve the System In-charge. Even if the customer cannot keep track of the shipment at all times, he/she could be notified with the updates via text messages, for e.g. If the vehicle/ship has crossed a part of the route an update message would be sent to customer saying "The cargo has arrived the <next part/destination> on route, check live status." At the time of delivery, we move to the delivery stage.

iv. Delivery Stage

At the time of delivery, the staffs of the vehicle give the customer the company tab to complete the order transaction. The customer first completes his payment (If COD) or the online payment is verified. The customer then

gets his O_id and B_id of all the boxes he is going to receive and to take them he has to submit an OTP. The OTP is sent to his mobile number or email.

Now after successful transaction, in the simulator, the Fleet Manager removes the number of boxes (to be given to the customer) from the lattice and the grid changes its pattern. The system disengages and the gets engaged again with new grid pattern covering boxes which are not getting unloaded during the delivery. The driver/staff unlocks the back door of vehicle, and unloads the boxes ordered by the customer. Then he closes the back door and the lock system engages. The final details of the order are updated in the database. If by any chance the delivery does not take place either the staff or customer has to cancel the order so that it can be ordered by someone else. The vehicle then continues on the route and repeats the procedure.

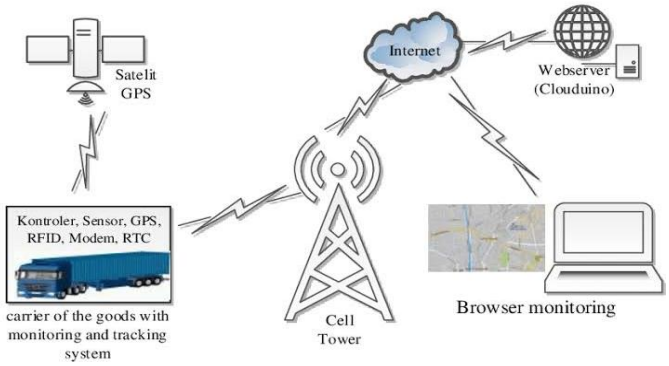

Fig -4:The working of System

Hence the above methodology ensures the secure transport and delivery of the goods. At the times of alert, the alarm goes on in the driver cabin, alert is sent to the Fleet Manager and also to the nearby police station via means of message along with the location attached.

4. PROS AND CONS

The benefit of having this software is that it not only tracks the goods along their delivery path but also omits the chances of incorrect cargo being unloaded. This will help in reducing the delays in shipment caused by wrong cargo being unloaded at a particular drop place. It also allows the customer to directly contact with the driver of the vehicle for any queries they have. It will serve the purpose of three different software systems (Security, Tracking and Order database) so customer doesn't have to implement them separately. This software still remains helpless in avoiding damage to the cargo as the hologram just sets the alarm in case of movement but does not stop the cargo from moving. Also, the hologram grid gets disturbed by the motion of the vehicle, causing false alarms at some times. It might have a huge cost of implementation at the start, but eventually it will become the most commonly used goods tracking system.

5. FUTURE SCOPE

The future of this technology includes use of laser shields to protect the cargo against damage as well as theft. The limitations of the hologram system were that even after the alarm would be set on, the cargo could still be picked in case of robbery. Moreover, the grid would be insensitive to the jerks of the moving vehicle which could reduce the chances of false alarms. Finally, offline mode for tracking the shipment would be introduced in the case of network issues. The tracking strength of satellite in case of densely clouded sky is still being worked on. This design promises a revolutionary change in the future of tracking technology for goods.

6. CONCLUSION

This software is an innovation to the field of goods tracking software and it will have great impacts after implementation. If the transport of goods is done as accurately as possible, time and money of both first party and second party customers would be saved. Key role of manufacturing companies is transportation of their products and if done perfectly, would make them a profit-making firm. The cost of implementation of the software would initially be high, but it would be worth considering the accuracy of shipment and safety of the goods. The software promises great deals in the future of tracking and security software.

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BIOGRAPHIES

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