

Intelligent Traffic System Which Respond To Emergencies

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Abstract— Congested roads and heavy traffic are major challenges these days. Traffic lights are the heart to prevent traffic jams. Making them intelligent makes time spent in traffic jams minimized for whom time is critical. Signal lights can respond to emergencies and act accordingly if made intelligent enough.

Keywords— intelligent traffic lights, emergency sensitive signal lights, Zigbee, Active RFID tags.

I. INTRODUCTION

Traffic lights can be made to be intelligent to recognize vehicles in emergencies and give them priority and let them pass the signals as early as possible. The system can be installed in vehicles of any government higher officials, ambulances or any others for whom time is critical. When any vehicle with emergency enters a road blocked with vehicles, and once the RFID card is taken out, the signal lights in that lane are given green signal. They are maintained green till it reaches the required opposite lane.

II. WORKING

An active RFID (radio frequency identification) tag is placed in the vehicle with emergency. Normally the tag is placed in the EMI shielded box. In case of emergency the tag is taken out and it scanned by nearby card reader. A Zigbee based micro controller system is placed to control the traffic lights and the timers. Zigbee modules and card readers are placed on the road dividers. When the vehicle passes by the RFID reader, its tag is detected and the ID is read by the reader. This ID is transmitted by the Zigbee module to the Zigbee module at the central place, where the ARM based system will verify that whether that is a valid ID or not and based on that it will take the decision. If a valid ID is detected then it will give green signal in

the lane of the vehicle. Zigbee here is just used for communication between RFID reader and the controller at the central place. The placement of the system can be as shown in the diagram.

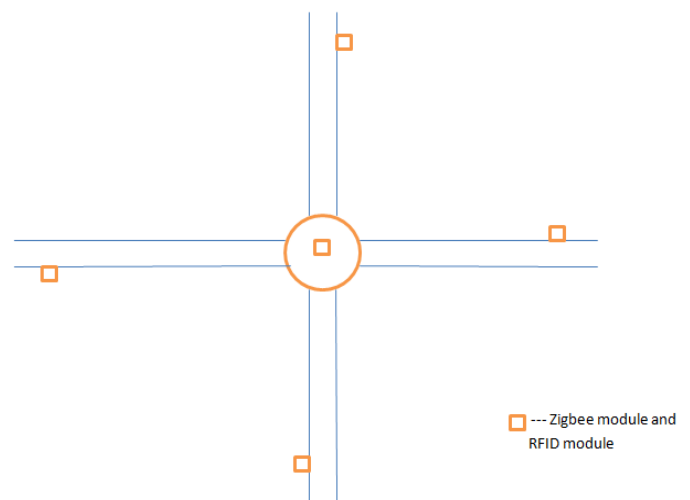


Fig. 1 A four lane road with systems placed according to the suggested placement.

A. RFID TAGS AND READERS

An active tag has an on-board battery and transmits its ID signal. Tags have individual serial numbers, so the RFID system design can discriminate several tags.

Tags may be read-only, having a factory-assigned serial number that is used as a key into a database, or may be read/write, where object-specific data can be written into the tag by the system user. Field programmable tags may be write -once, read-multiple. The tag's information is stored electronically in a non-volatile memory. The RFID tag includes a small RF transmitter and receiver. An RFID reader transmits an encoded radio signal to

interrogate the tag. The tag receives the message and responds with its identification information.

B. WHAT IS ZIGBEE AND WHY USE IT?

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios based on an IEEE 802 standard for personal area networks. ZigBee devices are often used in mesh network form. The Zigbee is used because:

1) *Power saving*: As a result of the short working period, low power consumption of communication, and standby mode.

2) *Reliability*: Collision avoidance is adopted, with a special time slot allocated for those communications that need fixed bandwidth so that competition and conflict are avoided when transmitting data.

3) *Low cost* of the modules and the ZigBee protocol is patent fee free.

4) *Short time delay*: Typically 30 milli seconds for device searching, 15 milli seconds for standby to activation, and 15 milli seconds for channel access of active devices.

5) *Large network capacity*: One Zigbee network contains one master device and maximum 254 slave devices. There can be as many as 100 Zigbee networks within one area.

6) *Safety*: Zigbee provides a data integrity check and authentication function. AES-128 is adopted and at the same time each application can flexibly determine its safety property.

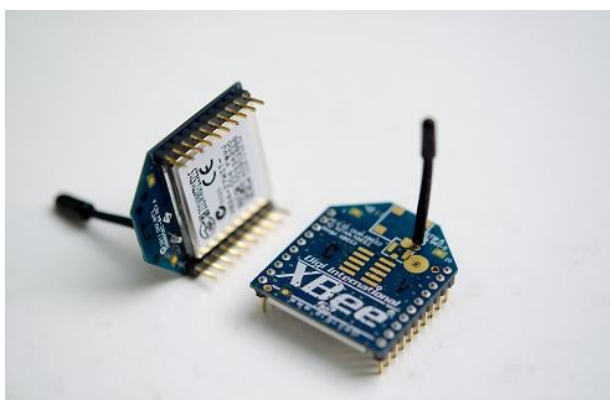


Fig. 2 Xbee modules.

C. WHAT NETWORK IS FORMED USING ZIGBEE?

Take an example of four road junction, there will be one Zigbee systems for every lane and one central Zigbee system. Total 5 Zigbee systems are required. One system at the central place is maintained extra for safety. For every fixed time all the modules on the lanes send a test signal to ensure that all the functionality is intact and every system is working .The network formed is star and each traffic light junction has a unique PAN(personal area network) ID and every module in the network is configured to that ID. The star topology is as below.

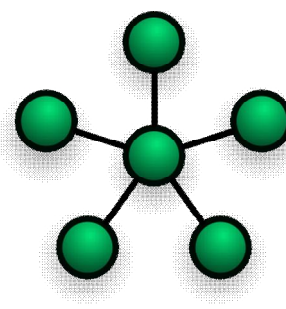


Fig. 3. Star topology.

III. CONCLUSIONS

The cost of installing the whole system could be initially high but it is a onetime investment. This can be installed in busy places in a city. Xbee modules which have a range of 120 meters can be used or Xbee Pro which has a range of 1.6 kilometers can be used. If the distance between the traffic signals is higher than range of one Xbee module then many Xbee modules can be used as repeaters to increase the range.

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