ZIGBEE IN WIRELESS COMMUNICATION

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Abstract—

The ZigBee module designed to operate within the ZigBee protocol (open source protocol which can be downloaded and used for developing various types of applications) to support GPS tracking system in terms of latitude and longitude. The module operates in the ISM 2.4 GHz frequency band with minimal power and provides reliable delivery of data between remote devices. The location of the object is seen on the map on the computer interfaced with the central unit.

Keywords—

Wireless communication, Wireless device, Zigbee, ZigBee protocol, ISM band, GPS
I. INTRODUCTION

ZigBee was created to address the market need for a cost-effective, standards-based wireless networking solution that supports low data-rates, low-power consumption, security, and reliability. ZigBee uses the PHY and MAC layers defined by the IEEE 802.15.4 standard for short-distance wireless communications. ZigBee is the wireless module which uses Zigbee protocol operates in the ISM 2.4GHz frequency band.

802.15.4 IEEE standard provides a robust foundation for ZigBee, ensuring a reliable solution in noisy environments. Features such as energy detection, clear channel assessment and channel selection help the device pick the best possible channel, avoiding other wireless networks such as Wi-Fi. Message acknowledgement helps to ensure that the data was delivered to its destination. Multiple levels of security ensure that the network and data remain intact and secure.

II. ZIGBEE ARCHITECTURE

Zigbee Stack Architecture is shown in Fig. 1.

Physical (PHY) Layer: The IEEE802.15.4 PHY physical layer accommodates high levels of integration by using direct sequence to permit simplicity in the analog circuitry and enable cheaper implementations.

Media Access Control (MAC) layer: The IEEE802.15.4 MAC media access control layer permits use of several topologies without introducing complexity and is meant to work with large numbers of devices.

Network and Application Support Layer: The network layer permits growth of network. This layer can handle huge numbers of nodes. This level in the ZigBee architecture includes the ZigBee Define Object (ZDO), user-defined application...
profile(s) and the Application Support (APS) sub-layer.

The APS sub-layer’s responsibilities include maintenance of tables that enable matching between two devices and communication among them, and also discovery, the aspect that identifies other devices that operate in the operating space of any device. The responsibility of determining the nature of the device (Coordinator / Router or End device) in the network, commencing and replying to binding requests and ensuring a secure relationship between devices rests with the ZDO (Zigbee Define Object). The user-defined application refers to the end device that confirms to the ZigBee Standard.

III. SYSTEM DESIGN

A. Hardware

To send the GPS information from mobile unit to fixed unit, we are using Xbee modules one as transmitter and the other as receiver. The transmitter is interfaced with GPS hand-held unit and Microcontroller and the receiver is interfaced to the Host computer at the other end. We send signals from MC through the ZigBee transmitter as shown in Figure 2 to the ZigBee receiver as shown in Figure 3 which is host Computer.

B. Software

The GPS data decoding software program has been developed using Embedded Basic language. The microcontroller is programmed using Embedded Basic language. The flowchart has been shown in following Figure 4.
IV. RESULT AND CONCLUSION

To evaluate the performance of the GPS system, the real time results were taken by GPS based Navigator System. The tested results are tabulated in Table I and Location of the place is seen on the map as shown in Fig. 5

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Latitude (North)</th>
<th>Longitude (East)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19 06 52</td>
<td>72 50 22</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>19 06 54</td>
<td>72 50 22</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>19 06 56</td>
<td>72 50 23</td>
<td>C</td>
</tr>
<tr>
<td>4</td>
<td>19 06 59</td>
<td>72 50 25</td>
<td>D</td>
</tr>
<tr>
<td>5</td>
<td>19 11 28</td>
<td>72 58 25</td>
<td>E</td>
</tr>
<tr>
<td>6</td>
<td>19 11 24</td>
<td>72 58 72</td>
<td>F</td>
</tr>
<tr>
<td>7</td>
<td>19 18 22</td>
<td>72 62 64</td>
<td>G</td>
</tr>
<tr>
<td>8</td>
<td>19 09 34</td>
<td>72 56 27</td>
<td>H</td>
</tr>
<tr>
<td>9</td>
<td>19 09 37</td>
<td>72 56 25</td>
<td>I</td>
</tr>
<tr>
<td>10</td>
<td>19 09 42</td>
<td>72 57 23</td>
<td>J</td>
</tr>
</tbody>
</table>

Thus the navigation display shows location’s latitude and longitude, and the advertisements related to that particular location which changes as it moves to different location. This data is send to the Receiver Unit through wireless communication network by the Zigbee end device.

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The role of Zigbee technology in future data communication system Dr. S.S. Riaz Ahamed. Professor & Head, Dept of Computer Applications, Mohamed Sathak Engg College, Kilakarai & Principal, Sathak Institute of Technology, Ramanathapuram, TamilNadu, India