The advantages of wireless sensor network technology

Science, Computer Science

With the fast pace of car availableness and usage in recent years, finding a vacant automotive parking zone is turning into harder, leading to variety of practical conflicts . Using Wireless sensor Network technology, we can make a low power solution to the current parking problem. The Wireless Sensor Network consists of a large number of smart sensors that form a multi-hop network by radio communication in sensor fields. They measure and process data gathered from the sensing space and transmit it to the data base station. Wireless Sensor Network will be employed in several fields like environment monitoring, intelligent transportation and smart homes . In this research I gathered data from many research and practical system. Here I will explain a system which is already implemented in some places in china.

In this system, there have a group of ten sensors, each one detecting periodically if there’s a car parked a car parking zone. This data is forwarded to a sink node. The sink node itself is connected to a Base Centre, that isn’t however a part of this analysis. The Base center will send data to other drivers to book the areas of free parking. The sensors nodes are based on the popular Arduino platform . Arduino is an open-source platform to make the prototype of the electronics with a very good library support and easy usability of code. For this project they developed a network protocol on top of nRF24L01 radio modules. For this they take some features from different network Wireless sensor protocols, above all clustering hierarchical protocols, like Low Energy proposed Single-Hop clustering Topology Adaptive clustering Hierarchy (LEACH) and Threshold sensitive Energy efficient sensor Network (TEEN) . The research paper will cover up describing the system

design the node hardware architecture and also the code libraries, design of the layer two and three WSN protocol operation and some future work

System Design:

Cluster Network:

For the cluster network they divided the sensors in 5 groups, one for each cluster and one for the sink node. Every cluster uses a specific RF channel. The sensors detect if there’s a car within the parking lot. The sensor is placed in a very strategically mounted position on the ground and can sense periodically to find cars. Knowing our nodes are deployed in a very fixed position, they set that the cluster members are invariable.

Sensor Node (SN): The sensor node is programmed for measuring the distance within a period and compare with the previous data. If the result has modified it sends AN advertisement message (ADV) to the cluster head.

Cluster Head (CH): The Cluster Head monitors an automobile parking space, but at the same time, it waits for advertisement messages from the other Sensor Nodes. It collects the data and forwards it to the sink node. This role rotates between all the nodes within the same cluster.

Sink Node: This mounted node is continuously listening on selected channels to forward packets, coming back from the cluster heads, to the management system and the management system then decides what to show to the end users.

Node Architecture:

In here Seeeduino platform is used, AN Arduino compatible development board, however with several enhancements on the hardware side, e. g., energy efficient surface mount device (SMD) components and additional analog and digital I/O pins. The Atmel ATmega328P microcontroller has thirty two kilobyte integrated non-volatile storage with read-while-write capabilities, one kilobyte EEPROM and 2 kilobyte SRAM. We have a tendency to use a dedicated nRF24L01 low power radio module operating in the 2. 4 , 2. 5 ghz ism band. The radio uses FSK modulation type and may operate among 125 RF channels with 250 Kb/s, 1 or 2 Mb/s of data rate. For Infra Red Module, they use the GP2Y0A21YK infra-red proximity detector made by Sharp, that may be a wide-angle distance measuring sensor that delivers AN analog output varied from 3. 1 V at 10 cm to 0. 4 V at 80 cm. For Power Supply, They use 6 external 1. 2 V rechargeable AA batteries (1300 mAh) providing 7. 2 V per Sensor Node and a USB powered sink node. Because the energy levels of the batteries decrease, the battery voltage goes down. In observe, the module stops operating properly below the 6 V cut-off voltage.

Software Libraries:

The source code arefrom GNU Lesser General Public License from Google Code website

Low-Power Library: This Arduino library, developed by Rocket Stream electronics, permits us to place the microcontroller into totally different power saving modes .

Radio Frequency Module Library: This library for the RF module, developed by J. Coliz. It will help to give the physical layer functions, sending and receiving packets. It also helps to change the RF channel which is very important for this project. Besides by this its possible to set the retransmission options and power down the chip.

Distance sensor Library: They developed this library to use Sharp IR Distance Sensors in Arduino projects. They use the sensor output to fetch the distance from a search table holding a sensor-specific transfer function.

Cluster Network Library: The team developed this library that implements the layer 2 and 3 operation of the system.

Authentication Library: For this we have to assume that a car is in a automobile parking space when the distance value is between 10 cm and 60 cm for many seconds. If the space value exceeds 60 cm, the automobile parking space is available. If the value is below 10 cm, then the we have to think that there is a car on the parking space.

Node Energy Library: Library that provides the current energy state depending on the time spent within the different phases. It’s used to decide that node has the highest energy state throughout Cluster Head choice.

The planning was to make a low-power Wireless Sensor Network solution for a sensible parking application. On its development, the work has led to new challenges and opportunities that might be fascinating to handle.

As per my view the next step will be the development of a mobile application and a server-side application that manages all sensor data, like its position with the help of gps, automobile types and parking lot status. The user would be able to hook up with the server using a web site or with smart phone application to request booking of the parking location. Another helpful plan is developing an application to monitor the parking lot which will be great for future. If all of this modules are integrated then it will be a standalone system and can be implemented any place or in any parking lots and space. Other then that there have really good chances to make it happen for the street parking. Hopefully it will be implemented on the street someday and people can check and book their parking from their smart phones.