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Comparison of Different Sensors using ARM Controller and Bluetooth

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ABSTRACT

Now-a-days, the advantages in wireless communication & electronics has accelerated to develop many wireless network solutions to replace existing wired network. A wireless network solution can support mobility & flexibility of nodes in network. Similarly security is important in wireless sensor network Bluetooth is generally considered as a short range wireless technology because of its less expensive cost, low power consumption and small size. Bluetooth uses short range radio links intended to replace the cable connecting portable and / or fixed electronic devices. It uses 2.4GHZ frequency band &providing security in sensor network is not an easy task. In this paper, we focused on comparative study of different sensors using arm processor and Bluetooth.

Index Terms- Keywords- ARM, Bluetooth, Sensors, Kiel.

I.INTRODUCTION

Since the network configuration of Bluetooth is based on the piconets where each piconets has one master and Up to 7 slaves .So the tree topology can be considered as a natural and Appropriate choice for the networks using Bluetooth. Thus the proposed system adopts the tree topology for self-configuration and routing. The tree topology has many advantages in that it is easy to find a multi-hope route to the control unit or a specific node, to maintain network, and to control medium access.

We describe a Bluetooth wireless sensor network for security systems which includes the implementation issues about system architecture, power management, self-configuration & routing.

II. LITERATURE SURVEY

A wireless network solution can support mobility & flexibility of nodes in network. Similarly security is important in wireless sensor network. Owing to the remarkable advantage of Bluetooth for security application is consider

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III.STUDY OF BLUETOOTH

Bluetooth, wireless communication technology between multiple digital devices, is essentially a network standard that works at two levels.

1) It provides agreements at the physical level; Bluetooth is a radio frequency (2.402GHZ-2.48GHZ) with in 10M radius space.

2) protocol- communication data format (staffing the bits) when to send, how to interpret, how to make sure the data is not corrupted.

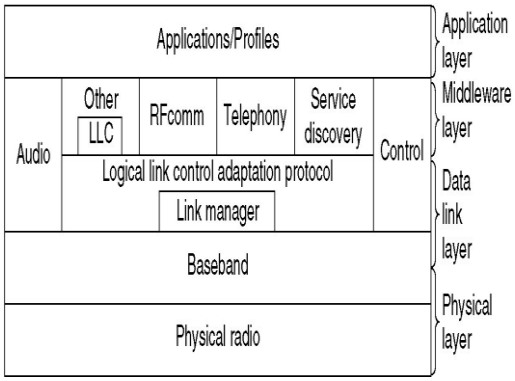

Figure 1 Bluetooth Stack

"Bluetooth is defined as a layer protocol architecture consisting of core protocols, cable replacement protocols, telephony control protocols, and adopted protocols. Mandatory protocols for all Bluetooth stacks are: LMP, L2CAP and SDP. Additionally, these protocols are almost universally supported: HCI and RFCOMM. Used for control of the radio link between two devices. In Basic mode, L2CAP provides packets with a payload configurable up to 64kB, with 672 bytes as the default MTU, and 48 bytes as the minimum mandatory supported MTU.

In Retransmission & Flow Control modes, L2CAP can be configured for reliable or isochronous data per channel by performing retransmissions and CRC checks. Bluetooth Core Specification Addendum 1 adds two additional L2CAP modes to the core specification. These modes effectively deprecate original Retransmission

and Flow Control modes: Enhanced Retransmission Mode (ERTM): This mode is an improved version of the original retransmission mode. This mode provides a reliable L2CAP channel. Streaming Mode (SM): This is a very simple mode, with no retransmission or flow control. This mode provides an unreliable L2CAP channel.

Reliability in any of these modes is optionally and/or additionally guaranteed by the lower layer Bluetooth BDR/EDR air interface by configuring the number of retransmissions and flush timeout (time after which the radio will flush packets). In-order sequencing is guaranteed by the lower layer. Only L2CAP channels configured in ERTM or SM may be operated over AMP logical links. Used to allow devices to discover what services each other support, and what parameters to use to connect to them. For example, when connecting a mobile phone to a Bluetooth headset, SDP will be used to determine which Bluetooth profiles are supported by the headset (Headset Profile, Hands Free Profile, Advanced Audio Distribution Profile etc) and the protocol multiplexer settings needed to connect to each of them. Each service is identified by a Universally Unique Identifier (UUID), with official services (Bluetooth profiles) assigned a short form UUID (16 bits rather than the full 128).

Standardized communication between the host stack (e.g. a PC or mobile phone OS) and the controller (the Bluetooth I.C.) This standard allows the host stack or controller I.C. to be swapped with minimal adaptation. There are several HCI transport layer standards, each using a different hardware interface to transfer the same command, event and data packets. The most commonly used are USB (in PCs) and UART (in mobile phones and PDAs). In Bluetooth devices with simple functionality, e.g. headsets, the host stack and controller can be implemented on the same microprocessor. In this case the HCI is optional, although often implemented as an internal software interface. Radio frequency communications (RFCOMM) is the cable replacement protocol used to create a virtual serial data stream. RFCOMM provides for binary data transport and emulates EIA-232 (formerly RS-232) control signals over the Bluetooth baseband layer.

RFCOMM provides a simple reliable data stream to the user, similar to TCP. It is used directly by many telephony related profiles as a carrier for AT commands, as well as being a transport layer for OBEX over Bluetooth. Many Bluetooth applications use RFCOMM because of its widespread support and publicly available API on most operating systems. Additionally, applications that used a serial port to communicate can be quickly ported to use RFCOMM.

BNEP is used to transfer another protocol stack's data via an L2CAP channel. Its main purpose is the transmission of IP packets in the Personal Area Networking Profile. BNEP performs a similar function to SNAP in Wireless LAN. Used by the remote control profile to transfer AV/C commands over an L2CAP channel. The music control buttons on a stereo headset use this protocol to control the music player. Used by the advanced audio distribution profile to stream music to stereo headsets over an L2CAP channel. Intended to be used by video distribution profile. Telephony control protocol-binary (TCS BIN) is the bit-oriented protocol that defines the call control signaling for the establishment of voice and data calls between Bluetooth devices. Additionally, "TCS BIN defines mobility management procedures for handling groups of Bluetooth TCS devices". TCS-BIN

is only used by the cordless telephony profile, which failed to attract implementers. As such it is only of historical interest.

Adopted protocols are defined by other standards-making organizations and incorporated into Bluetooth's protocol stack, allowing Bluetooth to create protocols only when necessary. The adopted protocols include: Point-to-Point Protocol (PPP) – Internet standard protocol for transporting IP datagram's over a point-to-point link. TCP/IP/UDP – Foundation Protocols for TCP/IP protocol suite. Object Exchange Protocol (OBEX) – Session-layer protocol for the exchange of objects, providing a model for object and operation representation. Wireless Application Environment / Wireless Application Protocol (WAE/WAP) – WAE specifies an application framework for wireless devices and WAP is an open standard to provide mobile users access to telephony and information services.

IV. SENSORS

Sensors that receives and responds to a signal. Informally, a sensor is a device that takes information from outside world. Based on information, the sensors create a signal on which a system can take decision. In our case, a sensor will measures some physical quantity and converts it into some electrical signal (volt or current). All sensors are transducer but all transducers are not sensors.

4.1 Sensors used in research work

The following sensors are used in research work:

1) Temperature sensor

2) Humidity sensor

3) Pressure sensor

4.1.1 Temperature sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic

TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

4.1.2 Humidity sensor

Humidity Sensor will sense humidity of atmosphere

4.1.3 Pressure sensor

The pressure sensor SPD005GA is a Smartec pressure sensor has an amplified analogue output. The sensor is compensated for offset, sensitivity, temperature drift and nonlinearity.

The sensor is available in the range from 5 to 100 psi. Other ranges on request. Available in Gauge and Absolute type. The output is ratio metric to the power supply voltage. @ 5 V power voltage the output span is 0.5 to 4.5 V. The SPD analogue series can be considered as an "analogue" successor of the SPD series.

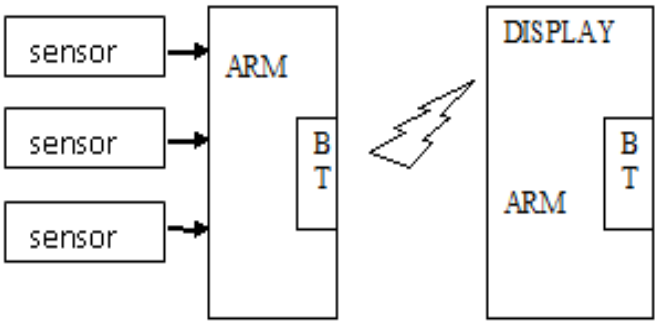

Figure 2: Block diagram of proposed system

V. RESULTS AND DISCUSSION

Different sensors are compared using proposed system and the results obtained are tabulated in the following Table 1. It shows the corresponding values of Temperature, Humidity and Pressure for different distances.

Table 1. Results

Distance (m)	Temperature (Celsius)	Humidity (Rh)	Pressure (psi)
2	20	30	70
3	21	40	85
4	22	50	90

VI .CONCLUSION

In this paper, the concept focused is comparative study of temperature, humidity and pressure sensor using ARM controller and Bluetooth .The future work will be to use this system for maximum distance and study number of sensors.

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