

Intelligent Living Space Controlling System with Bluetooth And Speech-Recognition Microprocessor

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Abstract: The intelligent living space controlling system with bluetooth and speech recognition microprocessor focuses on automatic control system for controlling the home appliances in space. The system is having two parts, first one consists of remote control mechanism with bluetooth module which is mounted on master remote controller and slave receiver module on every home appliance, the second one consists of the remote controller having speech recognition function of learning human voice. This helps the people to directly give command for controlling the appliances in space. After implementing this project the entire controlling system was proved successful. The result of this research has achieved national patent and nation award by Taiwan Education Ministry.

Keywords- Intelligent living space, bluetooth, speech recognition and home appliances.

I. INTRODUCTION

This paper mainly focuses on constructing the intelligent living space which is based in the bluetooth system and speech recognition microprocessor. A microprocessor is a multi purpose, programmable device that accepts digital data as input, processes the input data according to the programs stored in the memory and gives the result as output. Speech recognition mainly deals with the translation of spoken words into text. The study purposes of the system are: 1. to study the techniques related to blue-tooth modules and communication mechanism implemented in the intelligent living-space. 2. To develop a remote controller with speech-recognition and self-learning for human voice which can be used to control the appliances in the intelligent living space. 3. To make an interface between blue-tooth module and RS232 mounted on any microprocessor or PC. The whole system was proved successful by Taiwan education ministry.

3. THEORY OF BLUETOOTH

Bluetooth is a wireless technology which is standard for exchanging data over short distances (using short wavelength UHF), from mobile devices and building personal area networks. It can connect several

devices and overcomes the problem of synchronization. It is managed by Special group (SIG). It operated in the range of 2400-2483.5 MHz

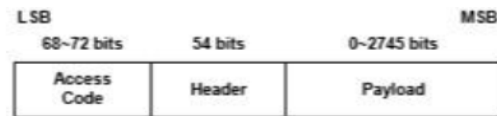


FIG- 3.1

In the above figure payload is the location where the data was placed in the message-package. There are two types of message-package which includes 1.asynchronous connection-less (ACL) and 2.synchronous connection-oriented (SCO). ACL message-package mainly sends general message and data with asymmetrical transmitting and the rapidest baud-rate could get to 723.2 Kbps whereas SCO mainly transmits vocal-message. A completed message-package could be accomplished after Header and Access-code were planted into managed payload. The net topology of blue-tooth could be divided into three kinds, one is point-to-point, the second is star and third id scatter net.

4. BASIC ARCHITECTURE OF BLUETOOTH NETWORK

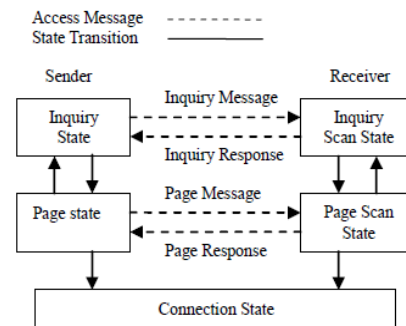


FIG.4.1 LINK FORMATION

When two Bluetooth devices want to link together in the communicated range, they must link under the defined space as shown in fig 4.1. This procedure was called Link formation .. The device which sends out inquiry signals is called master and the device which receives the signals is called slave. When one master device connected with more than two slaves, they formed a Pico-net, in which all Bluetooth devices formed a net system and shared the same one channel. Each Pico-net has only one master and at most 7 slaves in active status. The net-system connected by several Pico-nets is called Scatter-net. Slave device has four working modes-

(1) **Active Mode:** In this mode Slave and Master sends data to each other. Slave possesses AM_ADDR and jumped frequency queue in Pico-net. This is because there are at most 7 slaves in active status in one Pico-net; hence, the slave linking in this Pico-net and out of the original linked 7 slaves must enter the Park status and is not able to send any data in the system-net.

(2) **Sniff Mode:** Slave device could enter Sniff Mode to save consuming power. Slave would extend the signal-intervals on jumping-frequency when receiving master's signals. But Slave still kept AM_ADDR and jumped-frequency queue in the Pico-net.

(3) **Hold Mode:** when Slave enters Hold mode, it ceases to support ACL Linking, but still support SCO Linking.

(4) **Park Mode:** slave could enter Park Mode if need not send out data without departing from the Pico-net and wish to save consuming power

5. SPEECH RECOGNITION

Speech processing technique is divided into speech coding, speech synthesis, speech recognition, speech enhancement, and speech analysis. Speech coding is the process of converting sound waves traveling in the air into analog signal like current or voltage value through the converters like microphones, and then the analog signals are converted into digital signals through ADC (analog to digital converter). At last the microprocessor would fetch change digital-value of sound wave and its aptitude within certain period and fixed sampling rate. Each sampled point would be

indicated its aptitude with fixed bits and stored in larger space in microchip. In order to decrease the coding bit number and enlarge transition frequency band-width, it is necessary to adapt compression coding method with different compression ratio. Speech recognition is the process of making machines understands mankind language and commands to perform precise action. Speech recognition could be divided into units of syllable or sentence, and usually the shorter the sentence is, the more easily understood with the sentence. Speech synthesis is the process to reorganize speech units that were divided into variable units to be one language model and use many different commands to combine those language models into different speech to response mankind



FIG. 5.1 STEPS OF SPEECH PROCESSING

6. HARDWARE AND SOFTWARE DESIGN

There are communication protocols in blue-tooth modules as following:

- (1) The exchanged formats of electronic name-card (v-Card), electronic calendar, and daily schedules (v-Cal).
- (2) Wireless Application Protocol (WAP).
- (3) Conversation protocol (OBEX).
- (4) Telephone Control-Service Binary Protocol (TCSB).

- (5) Simulation Modem commands set (AT Commands).
- (6) Service demanding protocol (SDP).
- (7) Ethernet and web-net protocol (UDP/TCP/IP).
- (8) Point-to-Point Protocol (PPP).
- (9) Virtual Serial Port communication protocol (RFCOMM).
- (10) Logic Link Control and Adaptation (L2CAP).
- (11) Link Manager Protocol (LMP).
- (12) Base-band.
- (13) Bluetooth Radio.

RFCOMM, so to speak, as Cable Replacement Protocol, is simulation of serial communication port protocol according to ETSI 07.10. That means the simulation signals of RFCOMM are simulated the controlled and data signals of RS-232 serial port. In this paper the communication protocol and data format was used this kind of simulation signals.

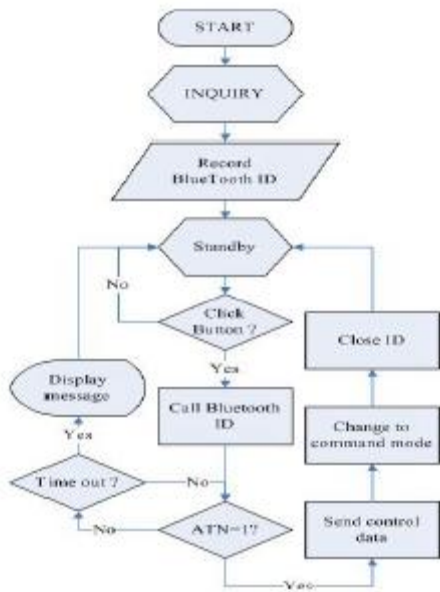


FIG.6.1 FLOW CHART OF MASTER MODULE

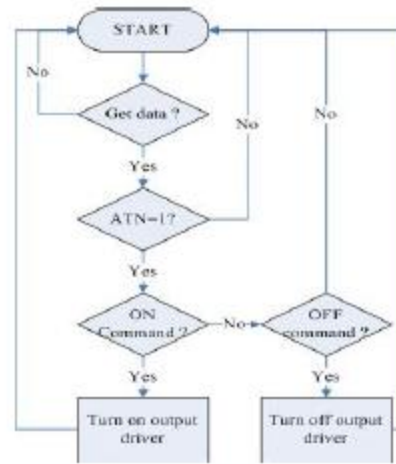


FIG6.2 FLOW CHART OF SLAVE MODULE

7.CONCLUSION

In this paper bluetooth system combines with the speech recognition microprocessor and forms a control module which is use for controlling the home appliances. The whole system adapted point to point linking mode into practical living space. The existing appliances are modified and bluetooth control module is added to them. After testifying and operating the system proved to be successful and stable. With the development of bluetooth module the whole system is planted to other remote control system for data collecting and monitoring.

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