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Near-Field Intra body Communication Through Human Arms Using Pc

R.Arthi, C.Thamilarasi

Abstract — IBC galvanic connection is a technique which couples low-power and low-frequency voltages in the human body used as transfer medium . The design is a promising approach that constitutes the personal health devices. Despite the significant advances made in recent years, including the influence of human tissues and different electrode configrations galvanic ibc parameters involved in the investigation and research efforts are still needed. The aim of this project is to design a realistic 3-D finite element model of the human arm using a galvanic connection.Unlike other computational models,the transfer of data from one source to another source through the IBC galvanic connection set up is carried on.Depending on variables such as frequency and distance between electrodes transmission path through human arm is allowed.Communication can also takes place by placing a group of people by touching each othershand.Transfering various kind of files are also carried on.This communication is more secured than any other wireless communication because it uses human body ad transfer medium.Numerous real time applications are emerging out based on this communication is briefly discussed. Finally, experimental measurements were also carried out for the sake of validation.

Index Terms **–** Galvanic coupling, intra body communication, personal area network, body area network, human body tissue.

I. INTRODUCTION

Intrabody communication (IBC) is a technique that uses the human body as a transmission medium for electrical signals [1], thus offering a natural channel to connect personalhealth devices within body area networks [2]. Three main IBC coupling techniques have been proposed in the literature: galvanic coupling [3], [4], capacitive coupling [5], [6], and wave propagation methods [7], [8]. The first two are based on lowfrequency, low-level currents, and voltages coupled into thehuman body. Specifically, the galvanic coupling uses four electrodes attached to the skin in differential mode, while the capacitive coupling uses a floating ground electrode that electrostatically couples the signal toward the external ground. In the wave propagation technique, usually related to higher frequencies, an electromagnetic wave propagates through the human body, generating no negligible radiated power into the surroundings. The advantages related to IBC, including the use of low-power signals at low-frequency ranges have drawn the attention of diverse research groups, in such away that great progress has been made at both IBC electronic design.

Galvanic coupling is a promising approach for wireless intrabody data transmission between sensors. Using the human body as a transmission medium for electrical signals becomes a novel data communication technique in biomedical monitoring systems.The objective of this project is to transmit the data from one PC to another through human body.This project requires low power. It can easily implement in real time. The proposed system will be miniaturized with the goal of realizing data transmission based on galvanic coupling in a biomedical system for monitoring vital functions.The project is designed with PC, RS 232, FSK modulation, FSK demodulation circuits, electrodes. The data from PC is given to the FSK modulation circuit via RS 232. RS 232 is the level logic converter. In the FSK circuit the signal from the PC is modulated and given to the human through electrode.Here the electrode is used to couple the human body with the circuit. in receiver first FSK demodulation circuit receives the signal from the PC and demodulate that signals. This demodulated signal is given to the PC via RS232.Present industry is increasingly shifting towards automation. Two principle components of today's industrial automations are programmable controllers and robots. In order to aid the tedious work and to serve the mankind, today there is a general tendency to develop an intelligent operation.

Near-Fieldintrabody Communication Through Human Arms Using Pc is designed and developed to accomplish the various tasks in an adverse environment of an industry. The intelligent using FSK, DFSK,RS232, ECG.This project is an own to the technical advancement. This prototype system can be applied effectively and efficiently in an expanded dimension to fit for the requirement of industrial, research and commercial applications.Microcontroller is the heart of the device which handles all the sub devices connected across it. It have used as microcontroller. It has flash type reprogrammable memory. It has some peripheral devices to play this project perform. It also provides sufficient power to inbuilt peripheral devices. It need not give individually to all devices. The peripheral devices also activates as low power operation mode. These are the advantages are appear here.The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.In telecommunications, RS-232 is a standard for serial binary data interconnection between a DTE (Data terminal

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equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. The standard does not define such elements as character encoding (for example, ASCII, Baudot or EBCDIC), or the framing of characters in the data stream (bits per character, start/stop bits, parity). The standard does not define protocols for error detection or algorithms for data compression.The standard does not define bit rates for transmission, although the standard says it is intended for bit rates lower than 20,000 bits per second. Many modern devices can exceed the speed.

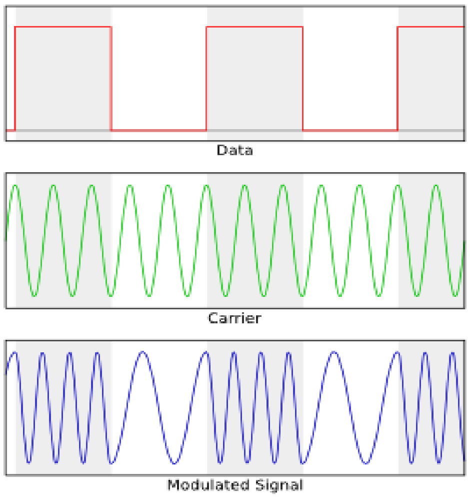

Fig.1. Waveform

The digital data communication and computer peripheral, binary data is transmitted by means of a carrier frequency which is shifted between two preset frequencies. This type of data transmission is called frequency shift keying technique. Frequency keying is a form of frequency modulation in which the carrier switches abruptly from one frequency to another on receipt of a command or keying signal. Most oscillator circuit can be subjected to FSK by simply designing them so that an alternative frequency determining component or parameter is selected on receipt of the key signal. The key signal or input signal may be delivered electro- mechanically via a switch, electronically via transistor gate or via PC etc. The XR – 2206 is the waveform generator specifically allocated for FSK use.

This IC has two alternative timing resistor pins such as pins 7 and 8. Either pin can be selected by applying a suitable bias signal to pin 9 of the IC. When the pin 9 FSK input terminal is open circuit or externally biased above 2v with respect to negative supply, the pin 7 timing resistor is automatically selected and the circuit operates at a frequency determined by R1 and C1. When pin 9 is shorted to the negative supply or biased below 1V with reference to the negative supply, the pin 8 timing resistor is selected and the circuit operates at a frequency determined by R2 and C1. The XR-2206 IC can thus be frequency shift keyed by simply applying a suitable keying or pulse signal between pin 9 and the negative supply.In this circuit the data signal to be modulated is out from PC through serial port.9 pin 'D' type connector is used to interface the PC and FSK circuit in which 3 pin is transmitting pin. This pin is connected to base of the Q1 transistor. When high pulse is coming Q1 is conducting so collector and emitter is short 0V is given to input of the two serious inverter so -12V is given to 9^{th} pin of XR-2206. When low pulse from PC Q1 transistor is in the cut off region so +12V is given to 9^{th} pin of XR-2206 vice versa. Depending on the pulse on 9^{th} pin the timing resistor R1 and R2 is selected from the pin 7 and 8 respectively. Here the capacitor C1 is kept constant. So XR-2206 generating two set of frequency 1200 Hz and 1400 Hz named as F1 and F2 respectively on the 11^{th} pin. Then the frequency shifted output is given to RF transmitter.

This paper is organized as follows : Section II presents the Related work from other authors.In Section III presents the experimental measurement set up for galvanic coupling using two pc's.In Section IV presents the Simulated results using Proteus software.Finally, Section V presents the final conclusion of this paper.

II. RELATED WORKS

A. A Survey On Intrabody Communications For Body Area Network Applications.

The rapid increase in healthcare demand has seen novel developments in health monitoring technologies, such as the body area networks (BAN) paradigm. BAN technology envisions a network of continuously operating sensors which measure critical physical and physiological parameters e.g., mobility, heart rate and glucose levels. Wireless connectivity in BAN technology is key to its success as it grants portability and flexibility to the user. While radio frequency (RF) wireless technology has been successfully deployed in most BAN implementations, they consume a lot of battery power, are susceptible to electromagnetic interference and have security issues. Intrabody communication (IBC) is an alternative wireless communication technology which uses the human body as the signal propagation medium. IBC has characteristics that could naturally address the issues with RF for BAN technology. This survey examines the on-going research in this area and highlights IBC core fundamentals, current mathematical models of the human body, IBC transceiver designs.

B. Personal Area Networks: Near-Field Intrabody Communication.

As electronic devices become smaller, lower in power requirements, and less expensive, it have begun to adorn our bodies with personal information and communication appliances. Such devices include cellular phones, personal digitalassistants (PDAs), pocket video games, and pagers. Currently there is no method for these devices to share data. Networking these devices can reduce functional I/O redundancies and allow new conveniences and services. The concept of Personal Area Networks (PANs) is presented to demonstrate how electronic devices on and near the human body can exchange digital information by capacitively coupling picoamp currents through the body. A low-frequency carrier (less than 1 megahertz) is used so no energy is propagated, minimizing remote eavesdropping and interference by neighboring PANs. A prototype PAN system allows users to exchange electronic business cards by shaking hands.A person who carries a watch, pager, cellular phone, personal stereo, personal digital assistant (PDA), and notebook computer is carrying five displays, three keyboards, two speakers, two microphones, and three communication devices.1 The duplication of I/O components is in part a result of the inability of the devices to exchange data. With proper networking these devices can share I/O, storage, and computational resources.

C. Development And Prospect Of Implantable Intra-Body Communication Technology

The grand challenge in the medical implant communication is how to provide sufficient energy for devices to gather and transmit signals.Only two methods are adopted to solve the problem,

- Biological electric circuit with low power consumption;
- External energy supply.

Service life of the battery is limited, it must be changed through surgery once the battery is used up, which will injure human tissues greatly.It is very important to reduce impacts of the intra-body communication upon human body, including local temperature rise caused by power loss as well as local stimulation. In order to avoid local temperature rise, hence choose the intra-body communication.

Challenges

- Energy supply
- Implantation of devices
- Communication security
- Physical model of channel
- Communication speed

For this reason, it is significant to establish a reasonable mathematical model of the implant intra-body communication channel.Not only can the model reflect channel characteristics,but also it can simulate effectively signal transmission in the channel.

D. Real-Time Medical Monitoring System Design Based On Intra-Body Communication.

With soaring of the sub-health population around the world, the traditional medical treatment has not met the increasing demand; it is urgent to create a modern nursing technology to provide service for human being. With development of the sensor technology and continuous improvement of the wireless communication technology, the new medical monitoring system has been gradually released from the traditional human-labor nursing. On the basis of development of the intra-body communication technology, a wireless, wound-free, portable medical system with real-time monitoring is proposed in this paper. In combination with the remote diagnosis system in the modern medical treatment, the sensor technology and the intra-body communication technology can be utilized to provide all-sided and real-time monitoring for individuals. Because data fusion can be effectively implemented between the systems and WAN & LAN, the model of the medical monitoring system for families is also presented in this paper, which offers guidance for further promotion of real-time medical monitoring.In the future medical monitoring system, as long as a person is equipped with the monitoring device, the device will monitor all of his physiological and health indexes in a real-time way, regardless of his activity at home, at the community or in the same city. These indexes are transmitted to the main-center (PDA) of the intra-body communication through the short-distance wireless communication network (Zigbee, GSM etc.).

E. Wireless Communication With Implanted Medical Devices Using The Conductive Properties Of The Body.

Implantable devices for physiological monitoring are used widely by clinicians and researchers to monitor health and to study normal and abnormal body functions. These devices can relay important signals (e.g., electrocardiogram, glucose level and blood pressure) from implanted sensors to external equipment to be analyzed or to guide treatment. Implantable devices can also be used to record neural signals in brain–machine interfaces to control prostheses or paralyzed limbs.Communication with implanted devices is usually accomplished with a wired connection or with wireless radiofrequency (RF) telemetry. However, wires can break, become infected or introduce noise in the recording through movement artifacts or by antenna effects. Complications with wires are frequently reported with deep brain stimulation devices and with pacemakers and implantable cardioverter-defibrillators.

Wireless RF telemetry has been used in several implantable medical devices to avoid the complications of wired implants. However, wireless RF telemetry requires significant power and suffers from poor transmission through biological tissue. RF telemetry also needs a relatively large antenna, which limits how small the implantable devices can be and prevents implantation in organs such as the brain, heart and spinal cord without causing significant damage. Other methods of wireless communication have been investigated to communicate with implants, including optical and ultrasound. However, these methods also have low-efficiency transmission through the body and would be difficult to miniaturize.

III. EXPERIMENTAL SETUP

Personal Computers

The Source PC will transmit the data to the destination PC through this setup by using human arm as transmission medium.Various kinds of files from one PC can be transferred to another PC.

Rs232 Communication

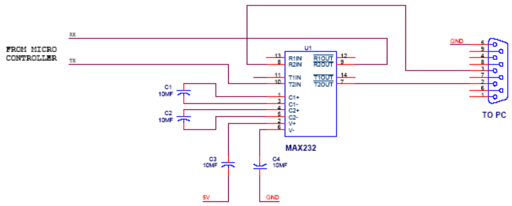

Fig.2. RS232 Communication

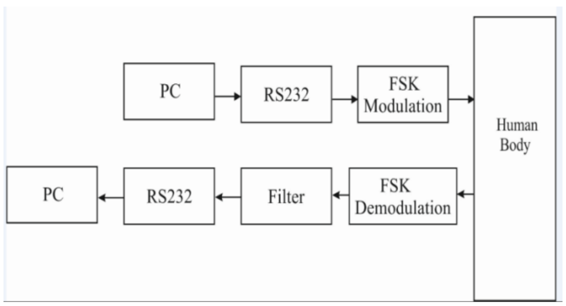

Fig.3. Circuit Diagram

In telecommunications, **RS-232** is a standard for serial binary data interconnection between a DTE (Data terminal equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. The standard does not define such elements as character encoding (for example, ASCII, Baudot or EBCDIC), or the framing of characters in the data stream (bits per character, start/stop bits, parity). The standard does not define protocols for error detection or algorithms for data compression.The standard does not define bit rates for transmission, although the standard says it is intended for bit rates lower than 20,000 bits per second. Many modern devices can exceed the speed.

The Electronic Industries Alliance (EIA) standard RS-232-C as of 1969 defines:

- Electrical signal characteristics such as voltage levels, signaling rate, timing and slew-rate of signals, voltage withstand level, short-circuit behavior, maximum stray capacitance and cable length
- Interface mechanical characteristics, pluggable connectors and pin identification
- Functions of each circuit in the interface connector
- Standard subsets of interface circuits for selected telecom applications

The standard does not define such elements as character encoding (for example, ASCII, Baudot or EBCDIC), or the framing of characters in the data stream (bits per character, start/stop bits, parity). The standard does not define protocols for error detection or algorithms for data compression. The standard does not define bit rates for transmission, although the standard says it is intended for bit rates lower than 20,000 bits per second. Many modern devices can exceed this speed (38,400 and 57,600 bit/s being common, and 115,200 and 230,400 bit/s making occasional appearances) while still using RS-232 compatible signal levels.Details of character format and transmission bit rate are controlled by the serial port hardware, often a single integrated circuit called a UART that converts data from parallel to serial form. A typical serial port includes specialized driver and receiver integrated circuits to convert between internal logic levels and RS-232 compatible signal levels.

Fsk Modulation

Frequency-shift keying (FSK) is a frequency modulation scheme in which digital information is transmitted through discrete frequency changes of a carrier wave. The simplest FSK is binary FSK (BFSK). BFSK literally implies using a pair of discrete frequencies to transmit binary (0s and 1s) information. With this scheme, the "1" is called the mark frequency and the "0" is called the space frequency. The time domain of an FSK modulated carrier is illustrated in the figures to the right.Frequency Shift Keying (FSK) is frequency modulation to transmit digital data, where the modulating signal shifts the output frequency between predetermined values, i.e. two different carrier frequencies are used to represent zero and one. More than two frequencies can be used to increase transmission rates. Frequency Shift Keying used to be used on the early low data rate modems as the modulation technique.A multivalued FSK modulation system is provided in which when data to be transmitted is multivalued and transmitted/received, the detection level is different every symbol. When a two-valued signal is transmitted as one symbol, data (11), (01), (00) and (10) are previously set to be, for example, a shift of −6, a shift of +6, a shift of +2, and a shift of −2, respectively. When data to be input next is (00), mapping is performed so as to provide a sign weight of +2 from the sign weight at the position of current data. When the data to be input next is (10), mapping is performed so as to provide a sign weight of −2 from the position of the current sign weight. The present invention is made to solve the above-mentioned problems. An object of the present invention is to provide an improved multivalued FSK modulation system. According to the present invention, a multivalued FSK (Frequency Shift keying) modulation system comprises the steps of obtaining a modulation signal in correspondence with differential data to a previous symbol value; differentially encoding (mapping) the modulation signal; subjecting signs between symbols to different conversion; and differentially encoding mapped data.

Fsk Demodulation

Frequency Shift Keying (FSK) demodulation is the process of recovering the original signal by detecting the frequencies involved in the original modulation. Typically, this is done with a bandpass amplifier tuned to one of the two frequencies, followed by a amplitude demodulator. The output is the original signal. It is possible, though often unecessary, to use two bandpassampliers, one for each frequency, but this is redundant. It is also possible to use a digital signal processing technique to perform a fourier transform on the input signal, but that can be complex and costly.A FSK demodulation circuit using counter techniques to distinguish between two transmitted frequencies, provides a delay preceding the change points of the demodulated signal to reduce signal distortion. Presettable counters reduce the number of data bits for processing, and a plurality of counters count an equal plurality of zero-cross intervals to reduce distortion. Registers and multiplexer further reduce circuit complexity.A multivalued FSK demodulation window comparator includes an MSB comparator, an LSB comparator, a reception electric field strength detector, and a reference voltage generating circuit. The MSB comparator determines at least the polarity of a frequency shift of a radio frequency. The LSB comparator determines the absolute value of the frequency shift of the radio frequency. The reception electric field strength detector detects the strength of a radio signal and outputs a signal corresponding to the detected strength. The reference voltage generating circuit changes the reference voltages of the LSB comparator in accordance with an output voltage from the reception electric field strength detector. When the output voltage from the reception electric field strength detector is not higher than a predetermined level, a reference voltage from the reference voltage generating circuit changes.An FSK demodulation circuit which receives as input an FSK modulated reception signal, obtains two quadrature pulse trains, i.e., a first pulse train and a second pulse train, from a phase detection circuit, is provided with at least two sampling means which use the edge of one of the pulse trains and sample the logic of the other pulse train, produces two or more sample outputs at different timings, and determines the logic of the reproduced data from a combination of the logics "1" and "0" of the sample outputs.

IV. SIMUATED RESULTS

Open the Proteus 8 professional and click the ISIS icon to execute the circuit. Click the Run button and view the output without data then type the data as connecting the capacitor and view the output for the circuit.

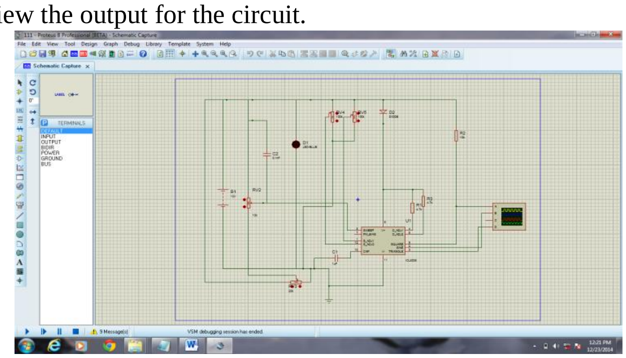

Fig.4. Circuit Diagram

Output Without Data

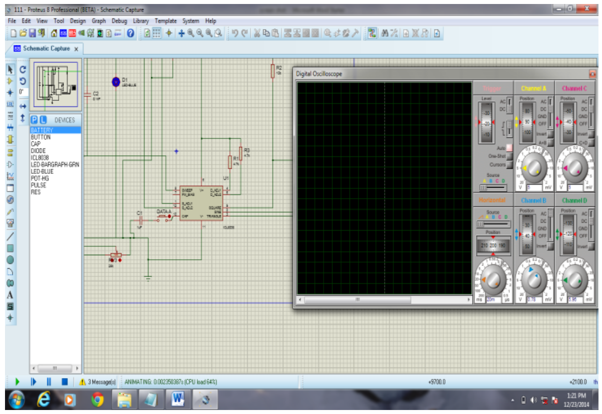

Fig.5. Output without data

Output With Data

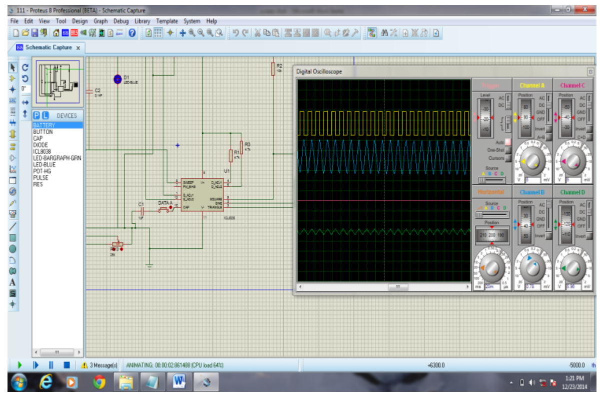

Fig.6. Output with data

V.CONCLUSION AND RESULTS

The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place.The proposed system based on control is found to be more compact, user friendly and less complex, which can readily be used in order to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial & research applications. Due to the probability of high technology used this"Near-Field Intra Body Communication Through Human Arm Using PC" is fully software controlled with less hardware circuit. The feature makes this system is the base for future systems.The principle of the development of science is that "nothing is impossible". So we shall look forward to a bright & sophisticated world.

Advantages

- Low power consumption
- Reduces the time
- Low cost to design the circuit, maintenance of the circuit is good
- Reliability
- Compatibility

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