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Hardware Implementation of Adaptive Learning Algorithm for Intra Body Communication

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Abstract: **A keyless entry system is an electronic lock that controls access to a building or vehicle without using a traditional mechanical key. The term keyless entry system originally meant a lock controlled by a keypad located at or near the driver's door that required pressing a predetermined numeric code for entry. Intra-body communication (IBC) is a novel data transmission method that uses the human body as medium to transmit the data. In this project an adaptive learning algorithm is implemented on micro-controller to control vehicle (on/off) for the data which is transmitted through human body. By using adaptive learning algorithm it is possible to find an optimal set of difficult input variables with great accuracy to control the vehicle.**

Keywords: **keyless entry system, Intra Body Communication (IBC), Adaptive Learning Algorithm, Control Vehicle.**

I. INTRODUCTION

A. Intra Body Communication:

In Intra-body communication the transmission medium used is human body, which has made much attention in personal area network (PAN).Since the signals pass through human body, the noise or the disturbances that interrups, obstructs, or the limits that effect the performance and interference is less to wireless technologies because the data is largely contained /transmitted with help of human skin. The characteristics of intra body communication are superior to those of other radio-based network technologies.

In PAN, in order to communicate between two ends PAN transmitter and receiver is used to communicate with the help of human body as the transmission medium. Whenever there is communication to be made, the transmitter produces a small displacement current which is transmitted through human body to the receiver. There is no need for transmitter in direct contact with the skin. The metal plates of the capacitor are used to store the charge. Whenever there is a communication between transmitter and receiver there is electric current produced and the two metal plates of the capacitor is used to store the charge and this displacement current is sufficient enough for the data to transfer through body to the receiver.

In a PAN, the electrodes between transmitter and receiver acs as two metal plates of the capacitor and the human body act as a dielectric between these two plates .Whenever there is data to be transmitted, the electric current and displacement current generated between the transmitter plate flows to other end of the metal plate with the help of human body as a dielectric medium between two plates as in any electric circuit we need a return path for the circuit to be completed. This return path is provided by the earth which acts as ground, and it includes all conductors and dielectrics in the environment that are in close proximity to the PAN devices. The isolation is provided with the help of earth ground, so that it avoids the circuit to be short circuited, as shown in figure 1.1

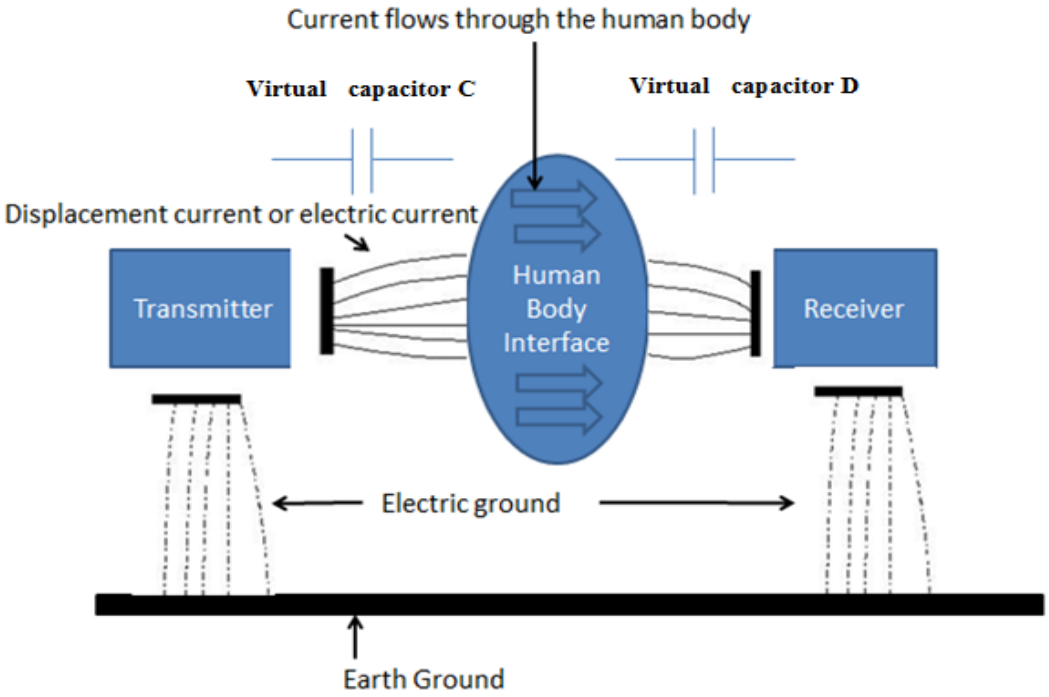

Figure 1.1: PAN device to the body

The transmitter couples the electric field generated to the human body .It also acts as a virtual capacitor(C) and the receiver electrode acts as a virtual capacitor (D).The receiver electrode receives the electric current and displacement current from the human body which was transmitted by the transmitting electrode . Hence the electric current flows through the human body due to the displacement current generated between the two plates of the capacitor. The other electrode of transmitter and receiver acts as ground .These electrodes act as a return path to the circuit by avoiding it from short circuit. Since the ground is at zero potential always, electric fields are setup between the ground and the electrodes .Thus providing the return path for the current is formed. Therefore current and data can be sent from the transmitter to the receiver just like any other electric circuit. The transmitters and receivers basically consist of an encoder and/or a decoder followed by the transmitting and receiving circuitry. So, typically the encoder will encode the input data in a suitable form and feed to a transmitting circuitry which converts the data into electric current. At the receiver the electric current is received, amplified, and then converted into data. The decoder then decodes the data into the bits of information that can be processed by the device.

B. Neural Network:

Neural networks are models of biological neural structures. The starting point for most neural networks is a model neuron, as in Figure 1. This neuron consists of multiple inputs and a single output. Each input is modified by a weight, which multiplies with the input value. The neuron will combine these weighted inputs and, with reference to a threshold value and activation function, use these to determine its output.

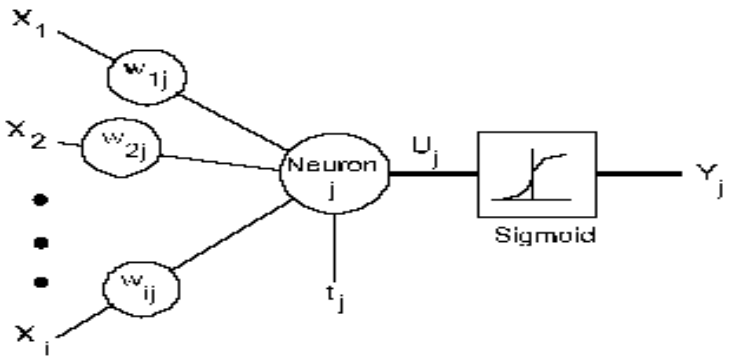

Figure 1.2: Neuron Model

Microcontroller is meant to connect and interact with a computer. It has an embedded microcontroller inside to facilitate the communication. The structure of a microcontroller is comparable to a simple computer placed in a single chip with all of the necessary components like memory and timers embedded inside. It is programmed to do some simple tasks for other hardware. In this project we are designing an intra-body communication encoder and decoder which is capable of communicating through body whenever the person touches the vehicle and an adaptive neural network algorithm is used to control the vehicle ignition control .By using this algorithm we can increase the computational speed of the proposed system and reduce complexity of the system.

II. PROPOSED NEURAL NETWORK ALGORITHM

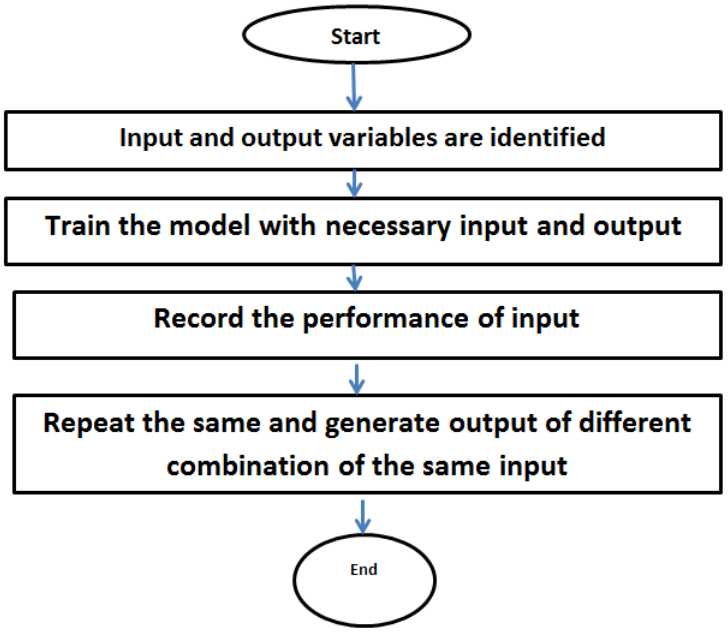

Fig 2.1: Flow Diagram of Proposed Adaptive Neural Network Algorithm

In adaptive neural network algorithm first the combination input and output variables are identified .For the respective input variables, the model is trained and the performance for the input model is recorded, similarly for different combination of same input variable ,the model is trained and performance for the input model is recorded .By sorting out the best performing input combination ,a particular combination is selected and assigned for that input variable in order to increase the system speed.

III. PROPOSED BLOCK DIAGRAM

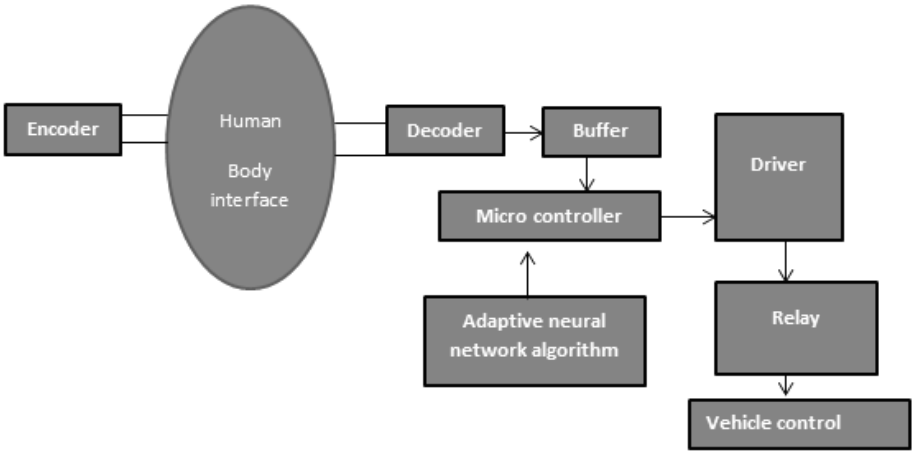

Figure 2.1: Block Diagram of proposed system

IV. METHODOLOGY

The transmitter circuit consists of encoder which generates frequency within the range 0-3MHz .Once there is contact with the probe and the human body ,the frequency generated at the encoder is transmitted through the body.

The frequency which is transmitted is received at receiver with the help of coupling capacitor once the human comes in contact with receiver probe. The received signal is decoded using decoder. The decoded message signal is then amplified and given to micro-controller .In micro controller we use adaptive neural network algorithm and trained this algorithm with set of predetermined input values ,its weight and output. If the received signal input values match the predetermined values only then there will be output generated and this output is driven by driver IC to relay .The relay switches or connects the ignition power to the starter switch.

V. ADVANTAGES

1) Data transfer is faster and easier through this technology.

2) Data loss during transfer is less.

3) Security is more.

4) By using neural network it reduces the complexity of the system.

VI. RESULTS

The intra body communication encoder is designed in an hand gloves and the decoder part is connected to the vehicle starter unit.

Once there is communication between the encoder, the decoder receives the encoded data through human body .The decoder unit decodes it and in microcontroller by using adaptive learning algorithm we control the vehicle ignition part which is connected to starter unit. If the decoded signal matches with the trained samples of the neural network else there will be no effect in the starter switch.

Figure 6.1: Encoder implemented in hand gloves

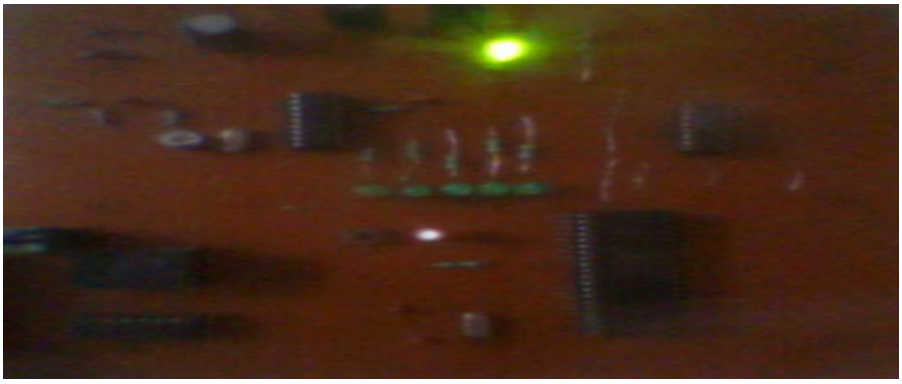

Figure 6.2: Decoder PCB board

Figure 6.3: Data Transmission through Human Body to the receiver circuit

VII. CONCLUSION

This paper addresses how data is transmitted through human body to control the ignition system which is connected to the start button of the vehicle by using adaptive neural network algorithm in micro-controller. By using this type of architecture, we can conclude that the system complexity decreases and increases the computational speed of the system.

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