Virtual Brain: Model-Based Framework for Dependable EEG Sensing and Actuation in Intelligent Brain IOT System

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Abstract -- Virtual brain research is accelerating the development of inexpensive real-time brain IOT Systems. Hardware improvements that increase the capability of virtual brain analyze and Brain IOT wearable sensors have made it possible, several new software frameworks for developers to use and create applications combining brain and IOT. It also enables multiple sensory pathways for communications with a larger sized data to users' brains. The intersections of these two research paths are accelerating both fields and will drive the needs for an energy-aware infrastructure to support the wider local bandwidth demands in the IOT cloud. In this paper, we complete a survey on brain activity extraction in IOT from various perspectives, including electroencephalogram (EEG) based IOT models, machine learning, and current active platforms. Based on our investigations, the main findings of this survey highlights three major development trends of virtual brain development system, which are EEG, IOT, and cloud computing.

Key words--IOT, artificial brain, electrical impulses, blue brain, EEG, wireless sensory systems

1. INTRODUCTON:

Virtual brain is an artificial brain, which is not actually the natural brain, but can act as the brain. It can think like brain, take decisions based on the past experience, and response as the natural brain can. It is possible by using a super computer, with a huge amount of storage capacity, processing power and an interface between the human brain and this artificial one. Through this interface the data stored in the natural brain can be uploaded into the computer. So, the brain and the knowledge, intelligence of anyone can be kept and used forever, even after the death of the person. First, it is helpful to describe the basic manners in which a person may be uploaded into a computer. Raymond Kurzweil recently provided an interesting paper on this topic. In it, he describes both invasive and noninvasive techniques. the most promising is the use of very small robots, or nanobots. These robots will be small enough to travel throughout our circulatory systems. Traveling into the spine and brain, they will be able to monitor the activity and structure of our central nervous system. They will be able to provide an interface with computers that is as close as our mind can be while we still reside in our biological form. Nanobots could also carefully scan the structure of our brain, providing a complete readout of the connections between each neuron. They would also record the current state of the brain.

2. LITERATURE SURVEY

Various surveys and inferences were considered first on which the IOT gateway system based on zigbee and GPRS protocols was considered. According to the typical IOT application scenarios and requirements from telecom operators, has presented the data transmission between wireless sensor networks and mobile communication networks, and conversion of different sensor network protocols. To enhance and improve wireless connectivity for heterogeneous IOT devices to communicate, they need multiple antennas one for each band or a wideband antenna the iot revolution is redesigning modern health care with promising technological, economic, and social prospects. This advances in IOT-based health care technologies and reviews the state-of-the-art network

architectures/platforms, applications, and industrial trends in IOT-based health care solutions. In addition, the distinct IOT security and privacy features, include the security requirements, threat models, and attack taxonomies from the health care perspective.

3. THE COMPARISON BETWEEN NATURAL AND ARTIFICIAL BRAIN

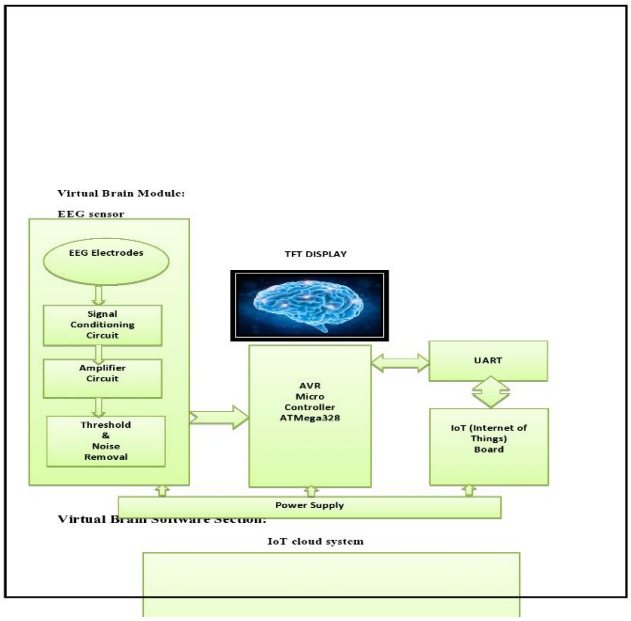
1. Input In the nervous system of our body the neurons are responsible for the message passing. In a similar way the artificial nervous system can be created by artificial neurons by replacing them with the silicon chip.

2. Interpretation: The electric impulses received by the brain from the neurons are interpreted in the brain. The interpretation in the brain is accomplished by the means of certain states of many neurons. The interpretation of the electric impulses received by the artificial neuron can be done by means of a set of register. The different values in this register will represent different states of the brain.

3. Output: Based on the states of the neurons the brain sends the electric impulses representing the responses which are further received by the sensory cell of our body to respond. Similarly based on the states of the register the output signal can be given to the artificial neurons in the body which will be received by the sensory cell.

4. Memory: There are certain neurons in our brain which represent certain states permanently. When required this state is interpreted by our brain and we can remember the past things. To remember things, we force the neurons to represent certain states of the brain permanently or for any interesting or serious matter that has happened implicitly. In the similar way the required states of the registers can be stored permanently, and when required this information can be retrieved.

5. Processing: When we take decision, think about something or make any computation, logical and arithmetic calculations are done in our neural circuitry. In a similar way, the decision making can be done by the computer by using some stored states and the received input and by performing some arithmetic and logical calculations.



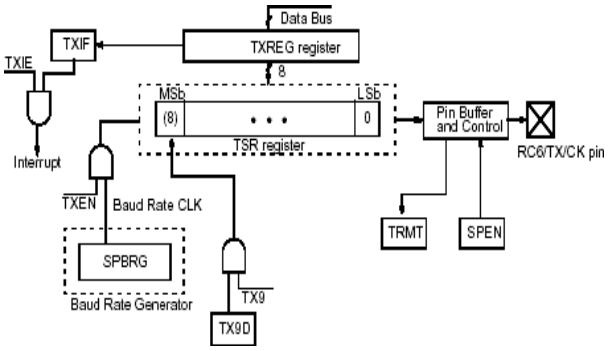
4. METHODOLOGY:

Brain receives signals from sensory neurons (nerve cell bodies and their axons and dendrites) in the central and peripheral nervous systems, and in response it generates and sends new signals that instruct the corresponding parts of the body to move or react in some way. It also integrates signals received from the body with signals from adjacent areas of the brain, giving rise to perception and consciousness. The human ability to feel, interpret and even see is controlled, in computer like calculations, by the magical nervous system. Its working through electric impulses through your body. As shown in the above diagram, through an EEG sensor the data from the brain is collected and given to the amplifier circuit for amplification which will aid in the transmission of the input signals from the brain. The information is transmitted and stored in a cloud storage system. By this the memory could be accessed whenever necessary by the user who has the password to access it.

5. WORKING:

5.1 Transmitter:

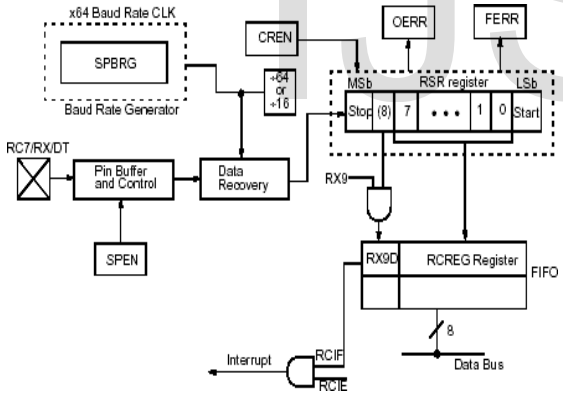
Initialize the SPBRG register for the appropriate baud rate. If a highspeed baud rate is desired, set bit BRGH.Enable the asynchronous serial port by clearing bit SYNC and setting bit SPEN.If interrupts are desired, then set enable bit TXIE.If 9-bit transmission is desired, then



set transmit bit TX9.Enable the transmission by setting bit TXEN, which will also set bit TXIF. If 9-bit transmission is selected; the ninth bit should be loaded in bit TX9D. Load data to the TXREG register and transmission starts.

5.2 Receiver:

Initialize the SPBRG register for the appropriate baud rate. If a highspeed baud rate is desired, set bit



BRGH.Enable the asynchronous serial port by clearing bit SYNC and settingbit SPEN. If interrupts are desired, then set enable bit RCIE. If 9-bit reception is desired, then set bit RX9.Enable the reception by setting bit CREN.Flag bit RCIF will be set when reception is complete and an interrupt will be generate if enable bit RCIE is set.Read the RCSTA register to get the ninth bit (if enabled) and determine if any error occurred during reception.Read the 8-bit received data by reading the RCREG.register. If any error occurred, clear the error by clearing enable bit CREN

TABLE 1

CONFIGURATION SUMMARY

Features	ATmega328/P
Pin Count	28/32
Flash (Bytes)	32K
SRAM (Bytes)	2K
EEPROM (Bytes)	1K
Interrupt Vector Size (instruction word/vector)	1/1/2
General Purpose I/O Lines	23
SPI	2
TWI (I^2C)	1
USART	1
ADC	10-bit 15kSPS
ADC Channels	8
8-bit Timer/Counters	2
16-bit Timer/Counters	1

6. SUMMARY

The main aim is to upload human brain into machine. So that man can think, take decision without any effort. After the death of the body, the virtual brain will act as the man. So, even after the death of a person we will not lose the knowledge, intelligence personalities, feelings and memories of that man and can be used for the development of the human society. The cloud having the memory can be accessed from any part of the world when the password is set and shared confidentially. The data is highly confidential so the cyber safety of the data is very important. The concept is that even if the person is absent physically his presence could be brought back to make decisions and do calculations. Any brain related ailments like memory loss due to Alzheimer's and Parkinson's can be cured.

7. FUTURE PERSPECTIVE

There is no fundamental obstacle to modeling the brain, and it is therefore likely that we will have detailed models of mammalian brains, including that of man, in the near future. Even if overestimated by a decade or two, this is still just a 'blink of an eye' in relation to the evolution of human civilization.

8. CONCLUSION

This paper has presented the way in which the BRAIN-IOT project intends to address such challenges. Leveraging existing open industry standards and based on the use and extension of open-source technologies, BRAIN-IOT has designed a software ecosystem capable of developing (using a model- based approach), deploying, assembling, orchestrating and managing sophisticated IOT applications, guaranteeing security and privacy protection of the data exchanged. In conclusion, we will be able to transfer ourselves into computers at some point. Most arguments against this outcome are seemingly easy to circumvent. They are either simple minded, or simply require further time for technology to increase. The only serious threats raised are also overcome as we note the combination of biological and digital technologies

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