

Architecture of Brain Thought Interactive Robotic System

(“A Shree Yantra”)

By

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Abstract:-

It's quite obvious that it's near to impossible to develop fully functional human brain in laboratory, which we can use for our robots for taking intelligent decisions by its own. When it is not beneficial to manufacture something by our own then we should go for a something which is already developed and which easily available with us. And that is our brain! A human brain! There are lots of research are going on in development of Brain Interactive Robotics System in these days. As a part of this research/development in BIR, here I present the architecture of future system called “Shree Yantra”, which shows how we can use the human brain thoughts as commands for robot to perform various tasks. This paper shows how different part of the one fully functional system could work. This also shows prototype of the algorithm which can be use for decoding of biotic/neurons signal and to generate appropriate command for robot.

Keyword :- BIR, Robotics, Intelligent System. augmentation

Introduction:-

There are lots of work is going on to develop something which is used to help handicap people to perform their day to day task, without the help of any other human. Today there are numbers of research are going on in medical and technology field to scan and sense the human thoughts. Several techniques are developed to scan and sense human thoughts [1,2,3,4,5]. We can use these techniques to sense human thoughts and use it in productive way. This “Shree Yantra” architecture is just one step towards achieving this.

As per this architecture first we need one cap like a gadget which we can wear on our head and it is use to sense bio-logical/biotic/neuron signal of our mind using one accurate and faster brain scan & sense techniques[1],[5],[6]. The gadget senses the signal and sends them into the smart computer using wireless or wired technology. In smart computer there is one algorithm installed which is called “PA”. This algorithm decodes & converts the signal received from gadget into appropriate commands and sends this command to robot. In robot there is small computer which receives command from smart computer and convert those command into actual mechanical instruction (i.e instruction which understand by the electronics controller and

mechanical device which are installed on different part of Robot body.) and send it to different sub part of the robot for actual operation.

For example, after wearing gadget if one thinks that “I want to raise my hand”. Then gadget sense this thought and converts them into digital form and send it to the smart computer through wired or wireless technology. Algorithm receives the digital signal and starts decoding procedure to decode the signal to understand human thoughts. Algorithms (“TA” And “PA” given below) uses two dataset; (1) First data set contains mapping of pattern received from gadget to its equivalent binary code (2) Second Dataset contains binary code and its meaning. Using two dataset algorithms decodes the signal and knows that this signal is to “raise hand”, it generates binary code according to that and sends it to small computer which reside in robot. The robot’s computer understands the command and sends appropriate instruction to the small motor (Or any other mechanical + electronics device which can rotate things at given angle) installed in both shoulders of the robot. The motor rotate and raise mechanical hand. Robot raises its hands [See fig 1.].

To enhance functionality of robot, camera can be installed as robot’s eye and microphones are can be installed as robot’s ear. Camera and microphone are connected to smart computer through wireless technology. Because of camera and microphone human can interact with the robot even if robot is away from person’s eye. Using cameras human can see surrounding of robot in smart computer screen and using microphone human can hear voice which generate around robot, even if robot is at remote location.

Method description/Example:-

Let’s take one example, suppose one handicap person wears sensing gadget and think to switch on fan in his room. Handicap person is in living room while robot is in garden. So, first that person needs to assume that his body itself is in garden. Person can verify robot’s actual position using camera installed in robot and the smart computer. Person need to think as his body is in garden and need to give command according to that. First person gives command to the robot to walk some steps till it reaches to the door of the house. Person can see whether robot reach to the door or not using smart computer screen, where robot’s camera sending visual signal. Once robot reaches to the door handicap person need to give step by step command using his thoughts to complete precedence task step by step; “Walk and go near(In front of) the switch board”, “Raise right hand towards fan switch”, “Press switch”, “Bring hand down” and then wait for another command.

We (Human) gives signal to our body to accomplish our day to day work and to ful-fill our need. The “Shree Yantra” fetches these signals from human mind. Converts it to digital form and then send it to the algorithm to convert it into mechanical command and then after it result into the robot’s mechanical movement.

Architecture of Smart computer:-

Brain thought sensing gadget is connected to the “Smart Computer”. Gadget sense and send signal to smart computer for further processing.

Smart compute is connected to camera and microphone which is installed on robot, through wireless or wired connectivity.

Smart computer has one program which receives the video streaming from robot camera and displays it on screen so that person who sits in-front of it can see it.

Smart computer has one program which receive audio signal from robot microphone and play it using speaker attached to smart computer

Smart computer has algorithm PA, which perform core task.

Architectural Overview of Robot:-

Its good to have a intelligent robot which can walk and move different body part and pickup the things [7]. Need to put one small computer (or need to reprogram Robot’s existing intelligent system) in Robot which is used to convert command (digital signal) comes from smart computer into the mechanical operation. It also used to control the robot’s physical movement.

There are small cameras in robot’s eye which are connected to smart computer via small computer of robot. These cameras captures the video and send them to smart computer so that the person sitting in front of smart computer can visualize the surrounding of robot, even if robot is far away from that person. By seeing the video signal sent by cameras, the person can give command according to robot’s current position.

There are small microphones in robot’s ear which is used to capture sound from surrounding and send them to smart computer. Person sitting in-front of smart computer can hear it from speaker even if robot is at remote place.

Robot’s computer has facility to generate and store internal log of all command (task) it perform.

Architectural overview of gadget:-

Gadget can be made by techniques which are used to scan & sense biotic/neurons signal more accurately like Electrographic [5] or can be made up of small chip of electro [6] or by using fMRI: spatial navigation by thoughts [1] etc..

Algorithms:-

Input: - Brain sensing gadget's output is applied as input to this algorithm

Assumption: - Gadget decodes the biotic signal of human brain and convert them into digital form with the help of biotic/neuron signal sensor and algorithm TA. Each body movement and each activity of human body has assigned one unique number with other parameters if any by the algorithm TA. For example raise left hand has number 1234, raise right hand has number 1244, walking has 1567, smile has 0777, stop smile has 0778, walk five step has 1567(5) =15675 etc..After decoding biotic signal, gadget sends the digital form of the signal into algorithm PA.

To hide the complexity we use English language word in place complex neuron signal format in this algorithm, like we use "raise left hand" in place of actual signal which is detected and sent by gadget to algorithm TA.

Prototype of Algorithm TA:-

- (1) Start
 - (2) Receive biotic signal from biotic/neurons sensor and it generate one code for the signal using internal "Activity Datasets", which has one unique number for all human body action & activities. (Few examples are given below :)
 - (3) ²⁹If signal="raise left hand" then vSend=1234
 - (4) Else if signal="walk 5 steps" then vSend=15675
 - (5) Elseif signal="raise both hand" then vSend=1236
 - (6) .
 - (7) .
 - (8) .
- (nnnn) End if
- (nnnn+1) Return vSend and Send it to smart computer (algorithm PA)

²⁹To make this algorithm simple to understand it's used English sentences in place of data/signal received from gadget.

Prototype of Algorithm PA:-

(1) Start:

If Input =1111("Aum"³⁹) then start receiving signal from gadget

(2) WHILE receiving digital signal from gadget LOOP

(3) If Input=0000("Shanti"³⁹) then stop receiving signal from gadget and end current task if any; exit algo.

(4) If Input=69("STOP") then end current task if any; break; (goto step 2)

a. Receive data from gadget

b. Decode incoming data and generate respective mechanical command and transmit it to the module "Mind". (Call Function 'Mind')

c. If command complete successfully by "Mind" play success sound.

Else stop receiving further signal from gadget and play alert sound. Rollback all the commands which are sent to robot and still not executed. Exit

(5) END loop (Goto step 2.)

Module: Mind

Input: Mechanical Command to perform & Task type

Output: instruction to mechanical parts installed in different area of Robot Body.

Start:

- i. If Task type is continuous then keep supplying instruction to appropriate mechanical part (Motor, rotator etc..) until stop signal is receive from gadget.(task like walking or clapping) ; exit module
- ii. If task is one type task then perform it once and exit module.

End

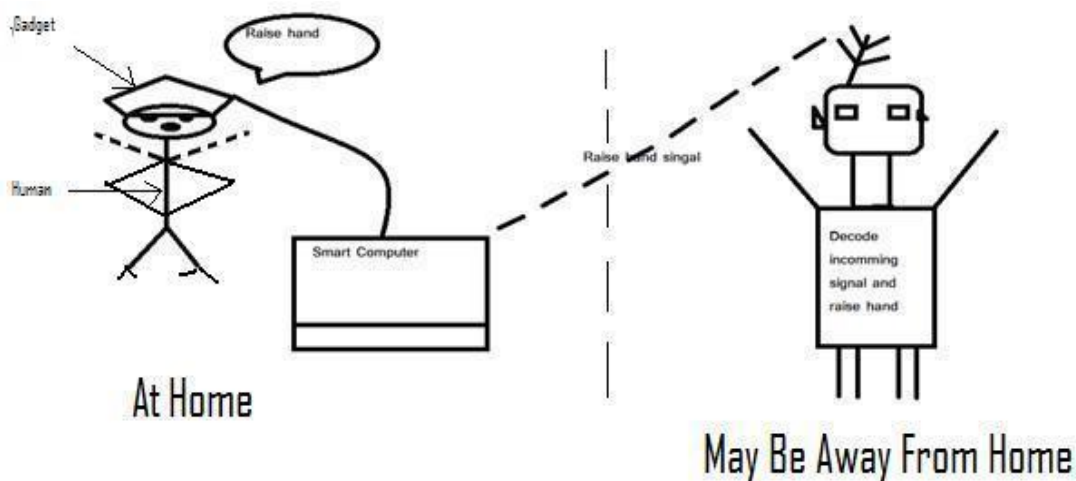
Advantage:-

- (i) This idea is very beneficial for the handicap and lazy people. The robot can be their housemaid (house servant) who operates by their thoughts, no need to even speak.
- (ii) This can be use for military service and to fight against terrorist activity as well.

³⁹ "Aum" and "Shanti" are comes from "Aum Shanti"; a Hindu religious "Mantra".

Drawing:-

Fig.1:-

Conclusion

Development of human brain using in lab is much more complex. It's near to impossible to develop a brain which has 90% accuracy and efficiency of human brain. BIR (Brain interactive robot) is real hope towards passive intelligent robotics.

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Future Work(Dependency):-

Medical and bio-technology scholar can work to build a gadget which decode biological/biotic signal from brain in more effective and accurate way. There is huge opportunity into development of Robot which operates more accurately and efficiently.

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