ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Smart Home Control with Brain and Computer Interface

Kante Latha Sri
M.Tech(VLSI & ES),
DVR College Of Engineering And Technology.

Pullam Ramesh, M.Tech
Assistant Professor
DVR College Of Engineering And Technology.

Introduction

Paralysis is one amongst the major neural disorder that causes loss of motion of one or more muscles of the body, wherein depending on the cause, it may affect a specific muscle group or region of the body, or a larger area may be involved. In pursuit of rehabilitation, the eye can be regarded as one of the organs that can help a paralyzed person to communicate suitably. Eye movement can be used by the paralysis patients and armless persons to perform simple tasks.

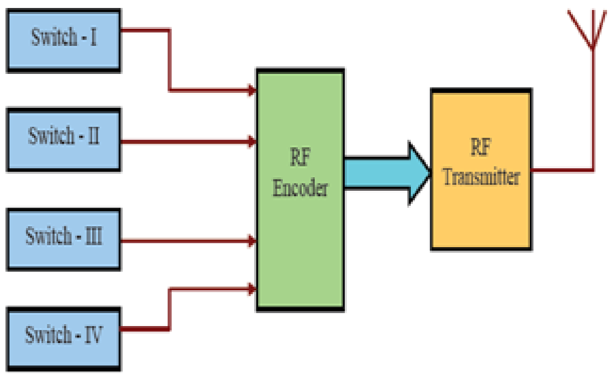
Existing method

Controlling industrial / home appliances is a very interesting and useful project. This project is designed to control up to four electrical appliances. This project used popular RF encoder and decoder IC's.

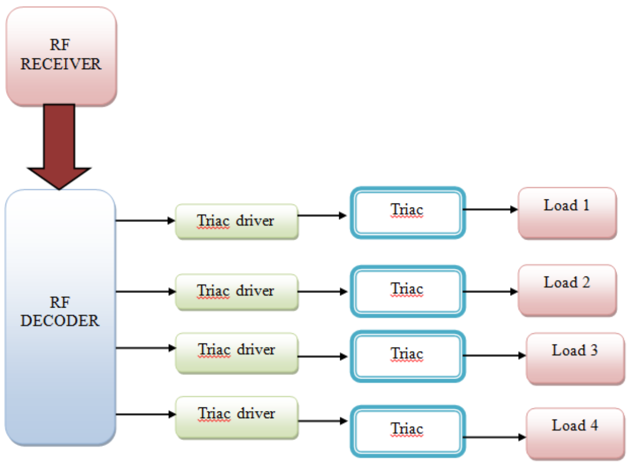
Four Switches are connected to the RF Encoder. This encoded data is transmitted through a RF transmitter module. In the receiver side, the RF receiver module receives the encoded data and decodes using an RF Decoder. This decoded output data is given to triac driver. Loads are driven through triacs. Up to 7A load can be connected to these loads.

Block diagram

TRANSMITTER



RECEIVER:



Draw backs

Few patients who are unable to move their hands cannot operate the loads through above mentioned procedure.

Proposed method

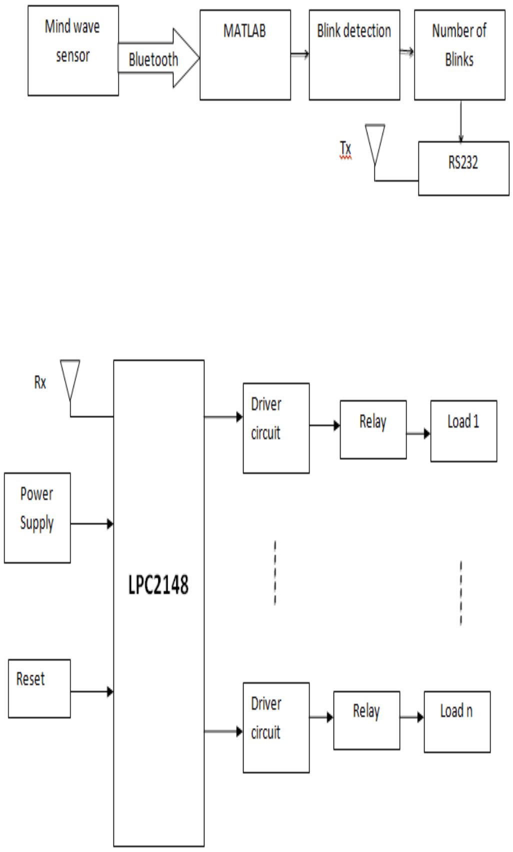
This project describes the acquisition and analysis of Eye blink signals for activation of home appliances for paralysis patients. The proposed method here uses a minimum number of electrodes for signal acquisition thereby reducing the occurrence of artifacts, further following a simple circuitry for implementation of signal conditioning which is also cost effective from the user point of view.

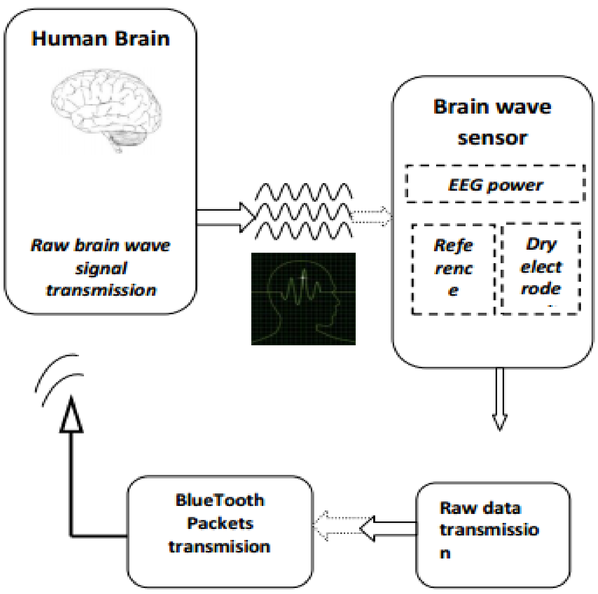
The standing potentials in the eye can be estimated by measuring the voltage induced across a system of electrode placed middle the eyes as the eye-gaze changes, thus obtaining the blinks. And this blink signal can be used as an input for a MATLAB in PC and perform classification and interfacing to microcontroller in order to control home appliances

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

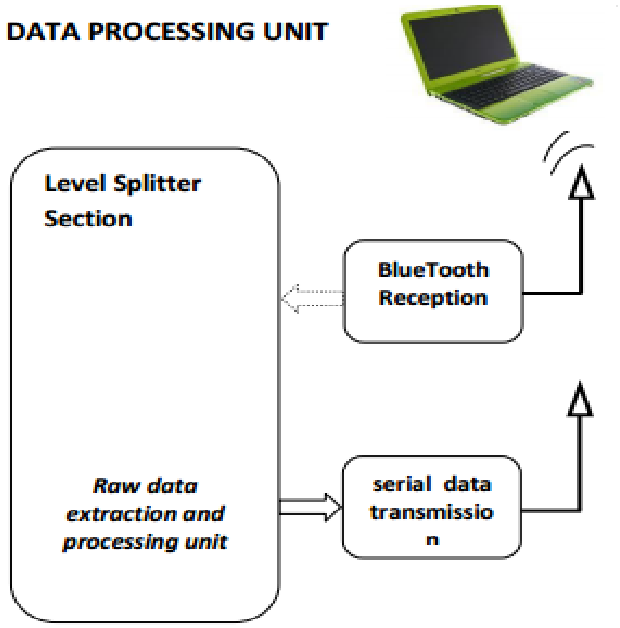
through RS232.Here we are using LPC2148 as our controller.

Block diagram

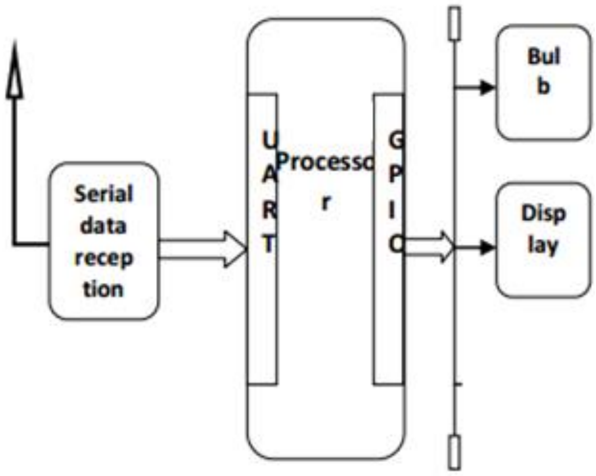




Brain computer interface section



Home appliance controller



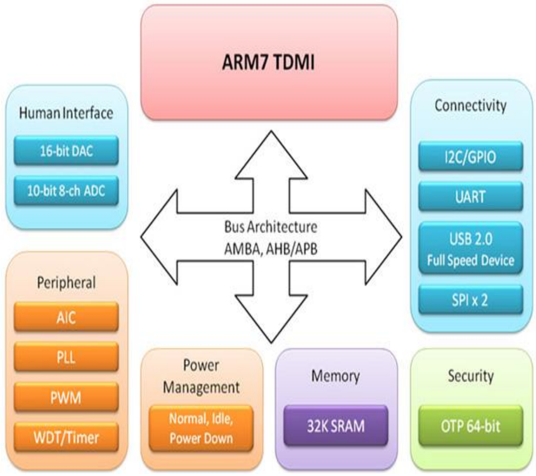
Modules used in this project

The **LPC2148** are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory.

A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.



This project uses regulated 3.3V, 500mA power supply. Unregulated 12V DC is used for relay. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

ARM7TDMI Processor Core

Current low-end ARM core for applications like digital mobile phones

TDMI

- T: Thumb, 16-bit compressed instruction set
- D: on-chip Debug support, enabling the processor to halt in response to a debug request
- M: enhanced Multiplier, yield a full 64-bit result, high performance
- I: Embedded ICE hardware

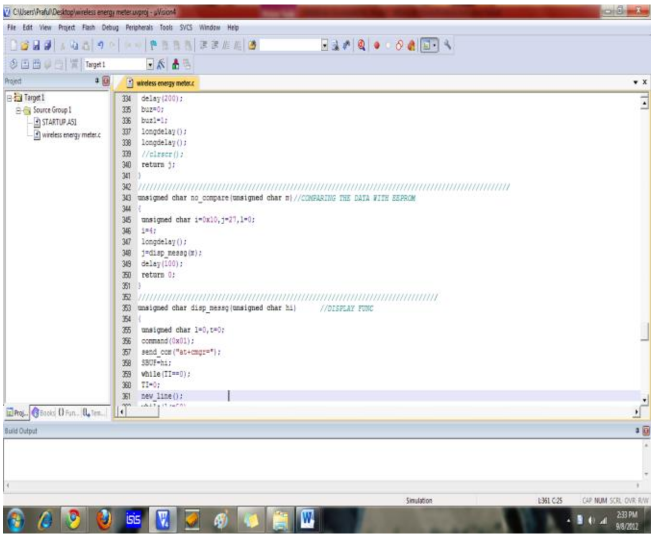
Von Neumann architecture

Mind wave sensor (EEG)

Electroencephalography (EEG) is the recording of electrical activity along the scalp. EEG measures voltage fluctuations resulting from ionic current flows within the neurons of the brain. In clinical contexts, EEG refers to the recording of the brain's spontaneous electrical activity over a short period of time, usually 20–40 minutes, as recorded from multiple electrodes placed on the scalp. Diagnostic applications generally focus on the spectral content of EEG, that is, the type of neural oscillations that can be observed in EEG signals.

Software tools

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.



Flash Magic

Flash Magic is a tool which is used to program hex code in EEPROM of micro-controller. It is a freeware tool. It only supports the micro-controller of Philips and NXP. It can burn a hex code into that controller which supports ISP (in system programming) feature. Flash magic supports several chips like **ARM Cortex M0, M3, M4, ARM7 and 8051.**

ISSN No: 2348-4845
International Journal & Magazine of Engineering,
Technology, Management and Research
A Peer Reviewed Open Access International Journal

Advantages:

- Ease of operation
- Low maintenance cost
- Fit and forget system
- No wastage of time
- Durability
- Accuracy

Applications:

- Hospitals
- Local monitoring applications
- Designed for Home and Clinical *Applications*

CONCLUSION

By using sensor, automation is being achieved. Experimental work is done carefully. This project is implemented using advanced microcontroller.

References:

[1] N. Birbaumer, N. Ghanayim, T. Hinterberger, I. Iversen, B. Kotchoubey, A. Kübler, J. Perelmouter, E. Taub, and H. Flor, „A spelling device for the paralysed," Nature, vol. 398, pp. 297- 298, 1999.

[2] C. Guger, A. Schlögl, C. Neuper, D. Walterspacher, T. Strein, and G. Pfurtscheller, „Rapid prototyping of an EEG-based brain-computer interface (BCI)," IEEE Trans. Rehab. Engng., vol. 9 (1), pp. 49-58, 2001.

[3] T.M. Vaughan, J.R. Wolpaw, and E. Donchin, "EEG-based communication: Prospects and problems," IEEE Trans. Rehab. Engng., vol. 4, pp. 425-430, 1996.

[4] D. Krusienski, E. Sellers, F. Cabestaing, S. Bayoudh, D. McFarland, T. Vaughan, J. Wolpaw, „A comparison of classification techniques for the P300 Speller," Journal of Neural Engineering, vol. 6, pp. 299 – 305, 2006.

[5] G.R. McMillan and G.L. Calhoun et al., „Direct brain interface utilizing selfregulation of steady-state visual evoke response," in Proceedings of RESNA, June 9- 14, pp.693-695, 1995.

[6] Y. Li, C.Wang, H. Zhang, and C. Guan, "An EEGbased BCI system for 2D cursor control," in Proc. IEEE Int. Joint Conf. Neural Netw., 2008, pp. 2214–2219. 893 http://ijesc.org/

[7] E. Donchin, K. M. Spencer, and R. Wijesinghe, "The mental prosthesis: assessing the speed of a P300-based brain–computer interface," IEEE Trans. Neural Syst. Rehabil. Eng., vol. 8, no. 2, pp. 174–179, Jun. 2000.

[8] N. Birbaumer, N. Ghanayim, T. Hinterberger, I. Iversen, B. Kotchoubey, A. Kubler, J. Perelmouter, E. Taub, and H. Flor, "A spelling device for the paralyzed," Nature, vol. 398, pp. 297–298, Mar. 1999.

[9] K.-R. M¨uller and B. Blankertz, "Toward noninvasive brain–computer interfaces," IEEE Signal Process. Mag., vol. 23, no. 5, pp. 125–128, Sep. 2006.

[10] J. Williamson, R. Murray-Smith, B. Blankertz, M. Krauledat, and K.-R. M¨uller, "Designing for uncertain, asymmetric control: Interaction design for brain–computer interfaces," Int. J. Human-Comput. Stud., vol. 67, no. 10, pp. 827–841, Oct. 2009.

[11] Y. Li, H. Li, and C. Guan, "A self-training semisupervised SVM algorithm and its application in an EEGbased brain computer interface speller system,"

Pattern Recognit. Lett., vol. 29, no. 9, pp. 1285–1294, 2008.

[12] Y. Su, B. Wu, W. Chen, J. Zhang, J. Jiang, Y. Zhuang, and X. Zheng, "P300-based brain computer interface: Prototype of a Chinese speller," J. Comput. Inf. Syst., vol. 4, no. 4, pp. 1515–1522, 2008.

[13] B. Hong, F. Guo, T. Liu, X. Gao, and S.Gao, "N200- speller using motiononset visual response," Clin. Neurophysiol., vol. 120, no. 9, pp. 1658–1666, Sep. 2009.

[14] A. A. Karim, T. Hinterberger, and J. Richter, "Neural internet: Web surfing with brain potentials for the completely paralyzed," Neurorehabil. Neural Repair, vol. 20, no. 4, pp. 508–515, 2006.

[15] E. Mugler, M. Bensch, S. Halder, W. Rosenstiel, M. Bogdan, N. Birbaumer, and A. Kubler, "Control of an Internet browser using the P300 event-related potential," Int. J. Bioelectromagnetic, vol. 10, no. 1, pp. 56–63, 2008.