







In the first phase, the texts which are programmed in a memory IC (24c16), read from the its memory location and the text will be fed to microcontroller.

In the phase two, the text which will be inputted from a memory IC to microcontroller unit (AVR atmega16), compare with the programmed text or number in microcontroller. In this each text is compared to its equivalent English alphabet or number in a ATMEGA16 microcontroller IC. The comparison of English text from 'A-Z' or the number from '0-9' will be fast, as a microcontroller which used is having a 1 MHz frequency with good throughput.

In the phase three, driving of electrical DC motor by the microcontroller to operate the mechanism for Braille board will be carried out. Also, the micro-controller section is having the communication to the computer via serial to com port.

In the phase four, the electro-micromechanical mechanism is used which available with six motors and the interfacing with the controlling by microcontroller. In this, respective motor will be worked according to the corresponding text to generate the English Braille alphabet. At the same, the alphabet generated on Braille board will be shown on computer for normal use.

With the help of this work, a blind person can read the tremendous knowledge available in the form of digital thing and also electronic text in their Braille language. It will work as blind welfare project and can improve the electronic reading of the visually handicapped.

The software part of proposed system composed of CodeVision AVR C Compiler which is used for programming part and flash magic used for showing the outputted text of Braille board on computer system via RS232.

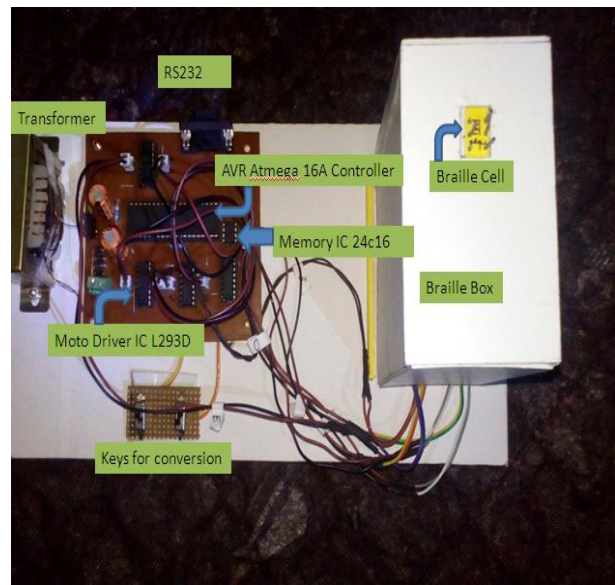
## 5. Results

The proposed system is implemented by the both hardware and software. The Hardware part composed of memory IC 24c16, micro-controller AVR Atmega16, RS232 for serial communication, six simple electrical DC motors with pin arrangement for Braille cell and computer system for showing the inputted text from memory IC to Braille board. The software part consist of Proteus 7 Professional\_PORTABLE ISIS for simulation, CodeVisionAVR C Compiler for programming and flash magic for displaying the outputted text of Braille board on computer system via RS232.

**Table 1:** Result table

Compactness	The Braille text can be read by single finger in their familiar reading manner.
Comfort	Automatic conversion from text to Braille with the soft foam sheet.
Power consumption	The mechanism can be operated at 12v and circuit at 9v.

Cost affectivity	Very low cost and can be easily afford by normal individual
Portability	The system is easy to handle and can move conveniently.
Reliability	The system will automatically convert the text from English to Braille according to programming
Automatic	The system based on automatic conversion without movement of the finger i.e. system is with a single cell.
Tactile conversion	Electronic data is converted into mechanically worked Braille for tactile reading.
Reading of the electronic book	The whole book can be read by blind according to programming in memory IC and system will worked as digital library for a blind.



**Snapshot 1:** Hardware implementation



**Snapshot 2:** Displaying of outputted text on computer system

## 6. Results Analysis

### Parameter

**Table 2:** Comparative analysis 1

Parameter	Fingers sensing the Braille Display[3]	Proposed Method
Tactile Compactness	Tactile sense by two fingers	Tactile sense by single finger(familiar manner)

Motors	Brushed Coin Vibration Motor(vibration sense cause an error)	Gear motor(forward & backward motion of motor provide perfect standard reading)
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**Table 3:** Comparative analysis 2

Micro-controller	PIC 16F877A[4]	AVR Atmega 16A (Proposed Method)
Instruction set/architecture	No add/subtract with carry, small stack	Add with carry, and compare with carry simplify multiple precision arithmetic
Power consumption	More power consumption	Brownout detector on recent parts has much lower consumption than the PIC one
UART	TX and RX can not be enabled individually	TX and RX can be enabled separately
Interrupts	Interrupts are not so efficient	Vectored interrupts are more efficient where there are multiple interrupt sources

## 7. Conclusion

A system with automated comparison algorithm for text to Braille conversion is having the fast conversion from programmed text into the tactile Braille. For analyzing the system, some issues are considered and according to that the system is being designed. The simulation results of the proposed system are shown in Proteus 7 Professional\_PORTABLE ISIS software. Also, the proposed system is having the key for speeding up or slowing down the speed of conversion according to the need of blind reader.

## References

- [1] Sudhir Rao Rupanagudi, Sushma Huddar, Varsha G. Bhat, Suman S. Patil, Bhaskar M. K., "Novel Methodology for Kannada Braille to Speech Translation using Image Processing on FPGA".
- [2] Ruman Sarkar, Smita Das, Dwijen Rudrapal, "A low cost Microelectromechanical Braille for blind people to communicate with blind or deaf blind people through SMS subsystem", 2013 3rd IEEE International Advance Computing Conference (IACC).
- [3] Ramesh Sankara Subbu, Pawan Gnanaraj, "Enabling visually impaired to read messages from modern gadgets", 2012 Sixth International Conference on Sensing Technology (ICST).
- [4] Mohamed Iqbal.M, Padma Balaji.L, Jayakar.M , Gokul.P, Karthik Kumar.R, Jairam.R, "Virtual Simulation and Embedded Module of Mobile Phone Using Modified Braille Display", 2014 2nd International Conference on Devices, Circuits and Systems (ICDCS).
- [5] Jia Yin, Lirong Wang, Jie Li, "The Research on Paper-mediated Braille Automatic Recognition Method", DOI 10.1109/FCST.2010.95, 2010 IEEE. 2010 IEEE.
- [6] Marcelo Bernart Schmidt, Luiz Gustavo, Alejandro R. García Ramírez\*, "Single Braille Cell".
- [7] Hideyuki Sawada, Feng Zhao, Keiji Uchida, "Displaying Braille for Mobile Use with the Micro-vibration of SMA Wires", 2012 5th International Conference on Human

- System Interactions978-0-7695-4894-4/12 2012 IEEE DOI 124, 2012 5th International Conference on Human System Interactions.
- [8] Majid Yoosefi Babadi, Behrooz Nasihatkon, Zohreh Azimifar, Paul Fieguth, "PROBABILISTIC ESTIMATION OF BRAILLE DOCUMENT PARAMETERS", 2009 IEEE.
  - [9] Feng Zhao, Keishi Fukuyama and Hideyuki Sawada, "Compact Braille display using SMA wire array", The 18th IEEE International Symposium on Robot and Human Interactive Communication Toyama, Japan, Sept. 27-Oct. 2, 2009.
  - [10] H. R. Choi\*, S. W. Lee', K. M. lung\*, I. C. K", S. 1. Lee\*\*, H. G. Choi\*\*, I. W. Jeon+, J. D. N a d "Tactile Display as a Braille Display for the Visually Disabled", Proceedings of 2004 IEEEIRSI International Conference on Intelligent Robots and Systems September 28 - October 2, 2004, Sendai, Japan.

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