Design and Development of Hardware Platform for Testing Robotics and Automation Applications

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Abstract

The 21st century is the century of robotics and automation in various fields of engineering to reduce human efforts. Robotics and automation has been proved since long time a helpful process of minimizing human labor and increasing throughput of production. Being a most preferred technology in various ways, it is necessary to design, develop and test the applications of robotics and automation. The design and development is done at various levels with respect to software and also testing of such applications is done on non-hardware platforms. It will be more advantageous to have a hardware platform to test such applications in order to understand its functionality in a better way than non-hardware platform. The paper titled design and development of hardware platform for testing robotics and automation applications is one such non-software platform.
Keywords- Robotics, Automation, Hardware platform, Applications, Non-Hardware Platform

I. INTRODUCTION

Robotic and Automation is now considered as one of the preferred choice for many to reduce human efforts and interference in order to have error free and high throughput production. Many big firm and big factories today mainly focuses on increasing their production. To achieve this they are transforming their organizations and working environment using robotics and automation processes. This helps them to have error free way of working and human less labor. This transformation for them has not only improved their organization but also has a lot of improvement in their throughput.

This robotics and automation runs with the application, which runs hardware for a particular way of working. The applications are developed using software and are also tested using software. When these applications are dumped into hardware there are fewer chances that it may work into the way it is expected. Finally making a big emphasis on redesign and developing from the primary stage to final stage in case if required. This may consume a good amount of time. If such applications are tested on hardware platform before dumping on the final target board, it not only reduces the effort of redesign and developing but also it may provide a better understanding of application and its functionality. This may also help developers and designers to have hands-on with respect to its operation in hand before being used in actual scenario. This paper describes one such hardware platform. The applications designed and developed for robotics and automation can be tested on this platform.

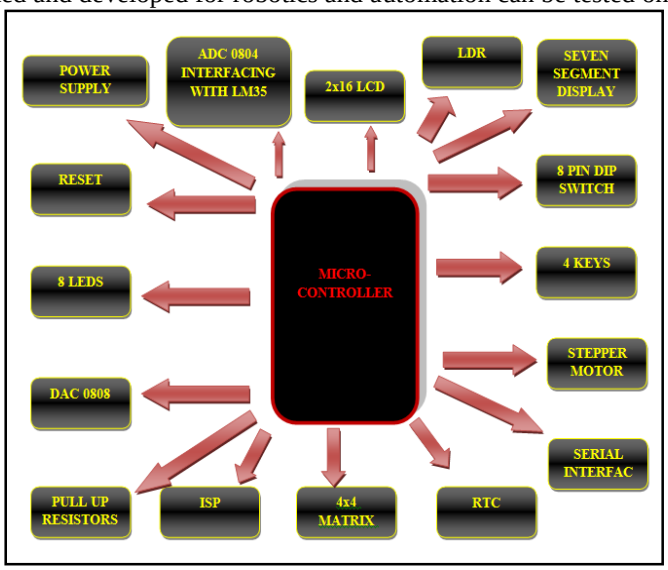

Fig. 1: Block diagram

As shown in fig. 1, a microcontroller and few additional components are attached to it, using one or more in combination helps in understanding the application by running on it. This platform as expected in fig.1, is designed and developed using hardware components as shown and software like keil **(**to create source files for testing this platform), ORCAD **(**to create electronic prints for manufacturing of printed circuit board) and PROGISP (for dumping the application which is to be tested).

II. HARDWARE PLATFORM DESIGN AND IMPLEMENTATION PROCESS

The design and development process of this hardware platform includes various processes as shown in fig.2, right from the designing till the end board.

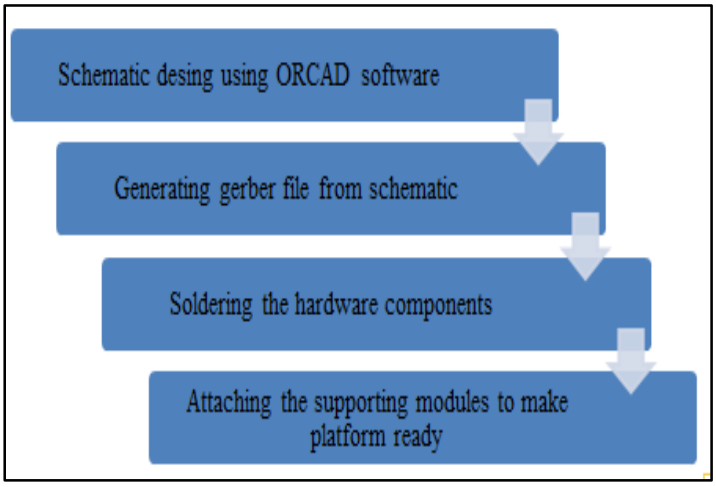

Fig. 2: Design and Development process

The blocks as shown in fig.1, are design using or cad as shown in fig.3, and a Gerber file was generated from it as shown in fig.4. This Gerber file is being transformed into a PCB board on to which hardware components were assembled and soldered as shown in fig.5. And finally all the necessary supporting modules were attached to it to make platform ready to use as shown in fig.6.

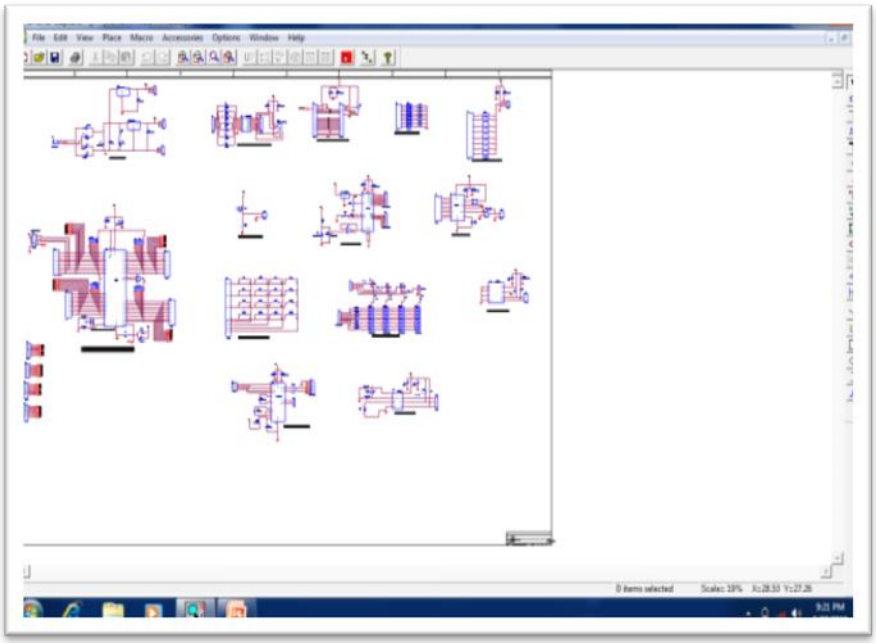

Fig. 3: Schematic design

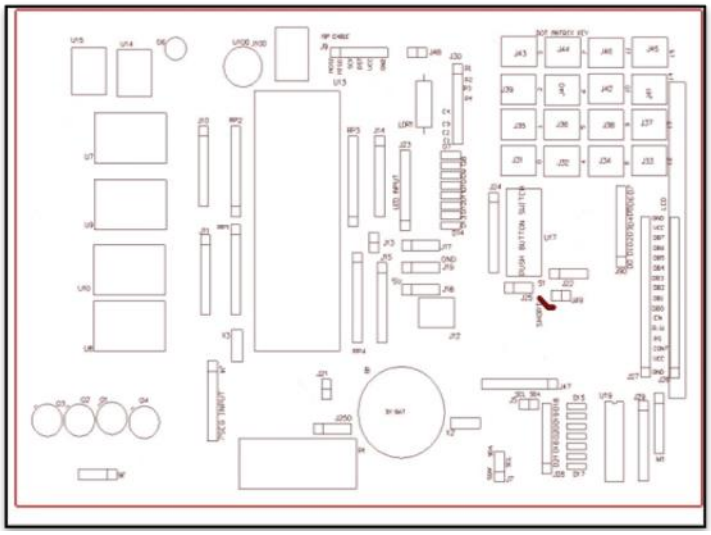

Fig. 4: Gerber file

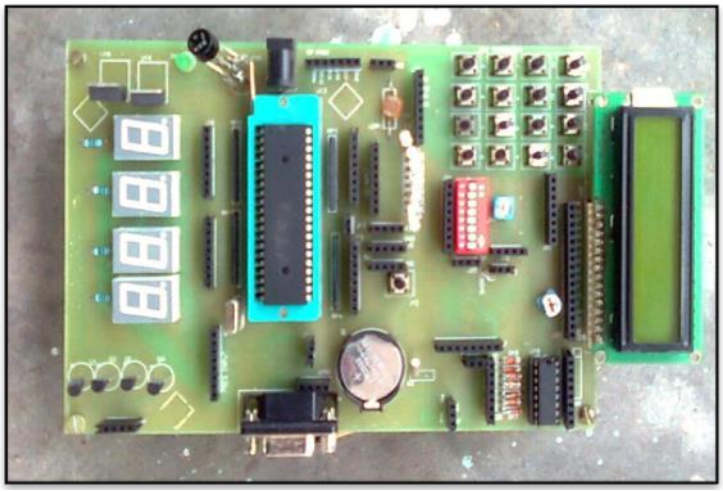

Fig. 5: Hardware assembled and soldered

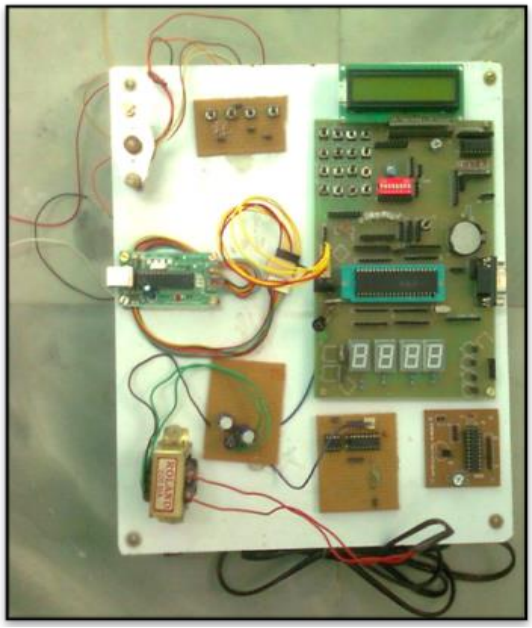

Fig.6: Hardware platform ready to use.

III. HARDWARE PLATFORM TESTING PROCESS

Ones the hardware platform is ready to use as shown in fig.6, it is being tested using application following the procedure shown in fig.7.

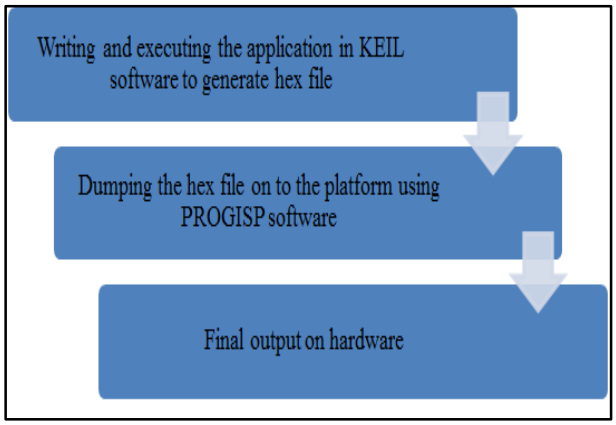

Fig. 7: Hardware platform testing platform.

The application written and executed in KEIL software shown in fig.8 is dumped on the hardware using PROGISP shown in fig.9, and output is observed on the hardware as shown in fig.10.

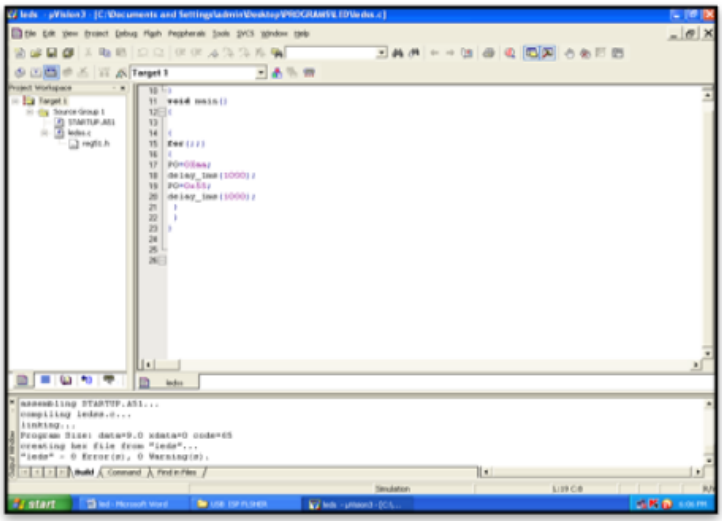

Fig. 8: Application written using Keil.

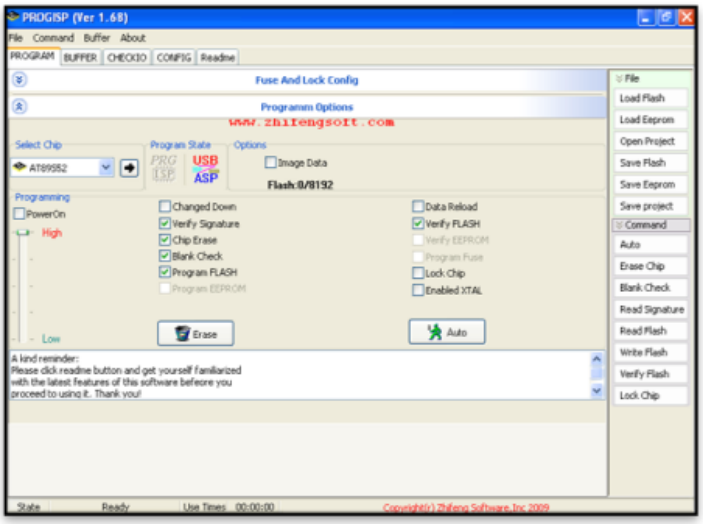

Fig. 9: Application dumped using Progisp.

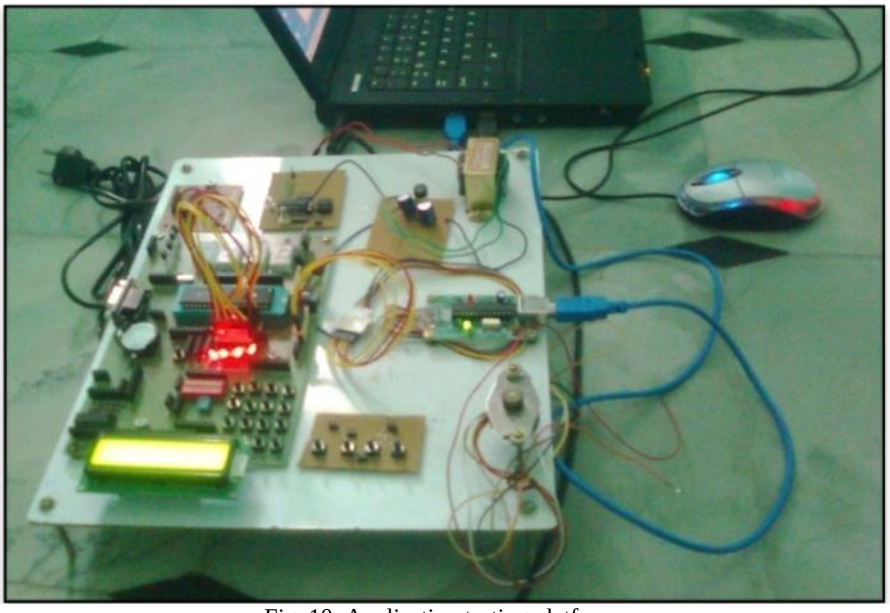

Fig. 10: Application testing platform.

IV. RESULTS AND DISCUSSIONS

The various applications as shown in fig.11 (a)-11(i) are being tested on the hardware platform shown in fig.10., it is being observed, that a big application of automation or robotics, can be broken down into small modules, and can be tested on the platform individually and also as a whole combined together.

Fig. 11 (a): LCD application

Fig.11 (b): Push button application.

Fig.11 (c): LED application.

Fig.11 (d): Seven Segment display Application.

Fig.11 (e): DIP switches application.

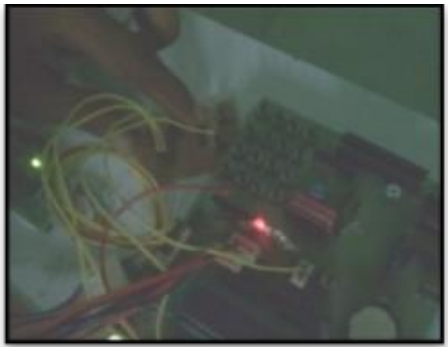

Fig.11 (f): Sensor application.

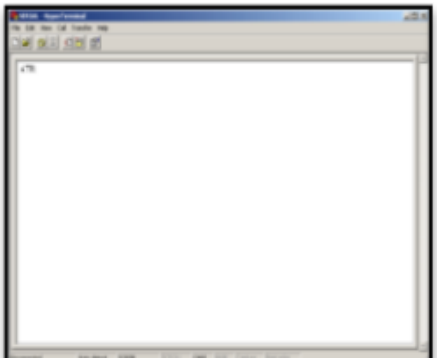

Fig.11 (g): Serial communication application.

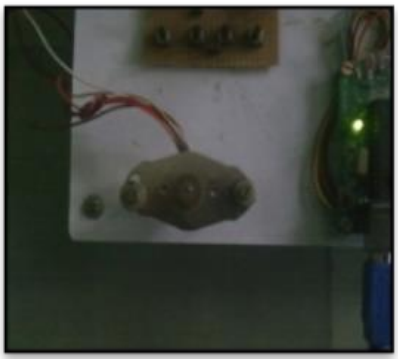

Fig.11 (h): Stepper motor application.

Fig.11 (i): LDR application.

V. CONCLUSION AND FUTURE DEVELOPMENTS

The 21st century is the era of robotics and automation finding its applications in almost all fields of engineering. Design and developing applications for these fields is considered to be the most important part of final product. But if testing on hardware before implementation is considered as one among them, then a final product can be implemented in better understandable way. This hardware platform so far discussed in this paper is one among possible platform for testing robotics and automation applications. This hardware platform can be developed further to make it as independent platform for writing, executing and testing applications on the platform itself.

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