The Digital Protractor

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Student of Aga Khan Academy, Hyderabad

Name: Sahil Salma

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Goal

At first I was not very focused on my goal but the thing that I knew for sure was that I have to do something in the field of physics & technology and based on this I thought of some ideas which were not much valid according to our personal project adviser and I didn't feel good hearing this. But then finally have no other option I came up with a new idea that was to make a digital protractor that is a device that can measure angles accurately. This was my final goal for personal project and this was based on what I wanted to do in the personal project. I chose this because it satisfied all my need as in what I wanted to do in my personal project and also my other ideas were very time consuming and at the same time I was inspired by this image (on pg.3 image 1). It is related to AOI human ingenuity as it's my

creativity that I am creating this product and also it is already there in the market and I am making it cheaper which is evolution of the product. It is connected to the AK strand Economics for development and it's related to it as my product will be cheaper that the one present in market and this will be a help in economic development of that area. My goal was in front of my eyes but I knew that it was very challenging to achieve it because it needs programing and I didn't know even basics of it. But then finally with my hard work, interest & support I achieved my goal and my journey in detail is on *achieving the goal on pg.14.*

My product should have the following specifications and they are as given below

- ⇒ Accuracy of 0.5 degree
- ⇒ Decent looks
- ⇒ Compact
- ⇒ Can measure the angles of 3-D figures
- ⇒ Light weight
- ⇒ Easy to operate

http://www.thinkgeek.com/product/efa7/

Selection of sources

I used many sources to achieve my product and I would like to share all of them. Some of them were useful whereas some weren't very satisfactory and here are all the sources they were informal surveys, informal interviews, video tutorials, images, classes, different websites etc.

At first I would start with the interviews & surveys. I never took a formal interview or survey with anyone it was just that when I meet some teacher, student, friend or family member I just explained my ideas to them & asked for suggestions on how can I make my product better and useful to the society and most of the ideas which they gave were very useful and then just gave rise to different ideas in my mind. I

thought this would be a useful idea and so I continued this throughout the project and it changed my product and it's a very different then before this was a very big advantage of this. I felt really good after doing this and then I continued other thing simultaneously.

Now I would say about the video tutorials & images part. This was a great resource of videos they thought me very well and I was able to do basic programming after watching them and I also learned how to make a circuit path I mean that I saw a video on how to create a path on circuit and I didn't understood it very well but at least got an idea on how it works and how it's done. I didn't use many images the only image related to my project is the one showed on pg.3 image 1. That to because it gave me inspiration on what I can do in my personal project. I chose to watch videos because

it was the best resources and even it was free & at the same time it was easily available at school.

Now I would talk about the most important resource of my personal project and I don't think I would have done it without this resource. It's the classes at 'Automation Engineers' and I have done 15 days classes here in order to learn programing and complete my personal project. This was very useful and the best part is it was very fast coursing of just 15 days and I sacrificed one of my vacation for this but I have no offence to it because I am interested in this and I want to learn it even further. The only reason why I chose this is because I think this is the only way I can learn programing in a better way because videos or something else can just give me an idea to what is programing but can't teach me in detail and solve all my queries.

After all this I wanted my product to be same or almost same to the image from which I got inspired but because of some limitation of resources and lack of time I wasn't able to do it. But my product definitely satisfied the main idea of measuring the angles accurately.

Application of information

This was the biggest project of my life till now and there were times where I had to take some decisions and they made a huge difference to the product and it is necessary to acknowledge all of them and here is it. So the most decision for this which I made was to join the classes at ‘Automation Engineers’ because I never knew how they taught and will it be useful to me or not. The only evidence I had was that they told me while joining that my project will be done definitely. So based on this I join this classes and I think this was the most important decision of the entire personal project and I would definitely say that the classes gave a very good result and I took a correct decision joining it.

Also when I was doing this kind of a project there would be many problems and same happened with me even I had many problems which I struggled with and as I already mentioned above I didn't even knew the basics of programing and this was the major problem which was solved with the help of 'Automation Engineers' and this made a huge difference. I even had many material problems like I wanted a device which can move 360 steps in 180° to get an accuracy of 0.5° and still I am not able to find such a device and for now I am using a device which can move 180 steps in 180° and definitely this has affected my product as using the current device I can get an accuracy of 1° which is half the accuracy I wanted but having no other option I have to use it and I am sure I will find the device I want as soon as possible. I even had some technical problems

like limitation of time and knowledge on programing and this was a bad factor which was solved later but for that time it was a crucial period I was on a stage where I thought of leaving the project but different people inspired me to continue and this saved me from leaving it. Some of the teaches from my school like Mr. Sudipta, Mr. Jaimin, Mr. Karim and many more teachers helped me in different ways and this gave me great confidence. Also there were times like I wanted to stop the scale at 180° but I wasn't able to do it and I am still at the same stage and there is no progress in this area of stopping the scales at 0 & 180° and this is affecting the accuracy of the device. There were many other challenges and problems but they weren't difficult to achieve or solve. Most of my problems were solved and some I am still working on to solve and I am sure I will do it.

Before all this it is necessary to know from where to start, where to stop and how to do it etc. and for this research is a necessary thing to do and that's what even I did. I took some interviews and surveys informally and this gave me an idea of doing it. I didn't even know that from where I am going to do the necessary things but I was focused on my goal and I knew I had to achieve it at any cost. I just researched about the topic and came to know about many facts which I never knew of. I got excited about it and researched even more and finally my research was useful and this made my product very different.

Achieving the goal

I have worked very hard in achieving the goal I set for me and I have already mentioned some areas of my work in the above parts and in this section I would combine all my working and explain in a short manner on how was my experience on achieving my goal and how far was it successful.

I have used a variety of resources to achieve my goal and they are mention in *Selection of sources pg.6*. The most important was classes at 'Automation Engineers' and they taught me on how to program and a micro controller also different devices like RFID reader, GSM and many other devices. It not only gave me an idea on how to do my project but also gave me knowledge on using and programing other devices also. I

think this will give me confidence in future and make my work easier.

I wasn’t able to make my product exactly same as I mentioned in the design specification, that is I wasn’t able to make my product as I wanted but I can surely complete the main aim of the project that was to make a device which can measure angles accurately and precisely and I think this was a good start but I don’t think I should end here but I want to evaluate on my mistakes and want to change them to make a product as I wanted and so here is my comparison with the design specification in table no.1 on pg.16

Table 1

Design Specification	Available in my product or not	Change/Extra
Accuracy of 0.5 degrees	No	It gives accuracy of 1 degree
Decent looks	Kind of yes	Not very royal
Compact	No	Not very compact but easy to carry
Can measure the angles of 3-D figures	Yes	
Light weight	Yes	
Easy to operate	Yes	

This was my evaluation with the design specification and I want to improve on the areas I left out (the parts which are no). The first one can be change easily to yes but there is limitation of resources and I am not able to find such a device, I won't repeat the entire issue because it's already mentioned in the upper parts. Now the other part on making it compact will require a little more time and knowledge. As per my research I found that to make it compact it would need higher level controller than I am currently using. May be an AVR or ARM controller and currently I am using a PIC controller which is an advance controller but not as advanced as AVR or ARM. So I don't think it would be difficult to reach where I want from this stage. After doing all this I would just make a product which would be similar to the one present in the market right now and

there won't be any difference between that product and my product. So to make my product different and more useful I thought of adding laser to it. This will make my digital protractor capable to measure angle at one point if two points are given.

All my ideas were good according to me and the people I asked but there can't be a creation without failures and even I faced many failures but at the same time there were people to support me and inspire me in such times. All my ideas weren't successful but finally I was successful in creating my product (digital protractor). Definitely I would say it was not as I want it to be but still I think I can start with this and improve on it. I already mention some ideas of improvements in previous pages and I am sure I this will be proved as a very useful device in the world of technology and at the

same time a change in many fields like architectures, mathematics, and many other areas. I think it was challenging but at last I was able to achieve my goal and at the same time learned many new things which are explained in the *Reflection on learning section on pg.21*.

Note: - Image of my final is on pg.20 image 2

Image 2

Reflection on learning

In this entire time during this personal project I have learned many things and many skills. So I would like to share my experience and also what I learned & how I learned? So at first I would like to start with the qualities like time management & importance of motivation. The most important quality that I think IB wants us to learn is time management and so all the works that we do are given certain time limit and as we all know that time is a very important factor in life. So by doing this personal project I have improved my time management and as a result I think I have produced a good product in the given time. Also the fact that I procrastinated & didn't plan my work in the early months of the project but then as I faced problems I changed my mind and planed all my work for particular

time and as a result I was able to complete my work without any kind of stress or tension. Another important factor is motivation. This happened with me several times as I thought of leaving the project but there were many people who motivated me to continue and I understood its importance in life. Above all of this I now know that how important it is to plan before you work because in the early months of the personal project I didn't plan my work and as a result I wasted almost two months of my valuable time and so from next time onwards I plan my work in detail and saved my time in the next term and also I was able to work more than I planned. So I would say planning is a very important part of time management. I even developed my writing & typing skills because the personal project was the only reason I wrote a process journal or typed a lot. Also the

fact that I learned a lot about the components of circuit and technology I mean the programing part. I was always interested in all this but I never tried to learn all this, it's only the personal project & Aga Khan Academy, Hyderabad which gave me a platform to learn this and many other skills and after doing all this in my personal project I can now confidently say that I can develop in this area and I can even get a professional touch in my work. I even learned about different technologies coming up in the market and also about the technologies need in market. I think personal project is a very good medium for the students to express their ideas in a systemic way. It is also a fun way to learn about the AOI and about the topic we chose. As in my case I got a vast knowledge about the AOI and the main motive of each one and also their importance in one's life. For

instance my AOI was human ingenuity and I thought it's only the creative and it's a small thing but as I worked with it I came to know that it's a vast area to learn and as we do go deep into it we found more and more about it. I came to know that each AOI is connected to other AOI in some or the other way. Now talking about the understanding about my topic there is a lot I understood because when I started I didn't even knew the basics of what I wanted to do and after the personal project now I have got confidence about my work. I would like to give examples of some areas like this, first of all I learned about the components used in a simple circuit and acquired some knowledge about them and gained detailed knowledge about the one's I was going to use for doing my project. I used a micro controller in making my product which is PIC 16F676. This is a PIC series

controller and is the first advanced micro controller series. I had never heard about the micro controllers before and it was only the personal project because of which I learned about it and now I am on such a stage where I can program this kind of micro controllers for some application. So you can imagine my progress and my understanding over the topic. So at the end of my reflection I want to say that all I did was good enough but there were many mistakes which I did and they cost me a lot of time. Definitely I improved on them later on but I think it was a bit late for that and finally I understood the fact that it is better to plan our work because it saves time as well as reduces stress and tension which intern results in better work.

Work Cited

I already mentioned it the previous pages that from where I got the idea of making a digital protractor. (For further details refer pg. 4 & 5)

There were many ways I from which I acquired the knowledge of the concept I worked on. But when I started I didn't knew what to research and so I watched different videos like how to make a circuit path? How to draw a circuit path? And things like this. But when I realized my work is based more on programing side I joined a class called "Automation Engineers" and this is where I learned most of the needed things.

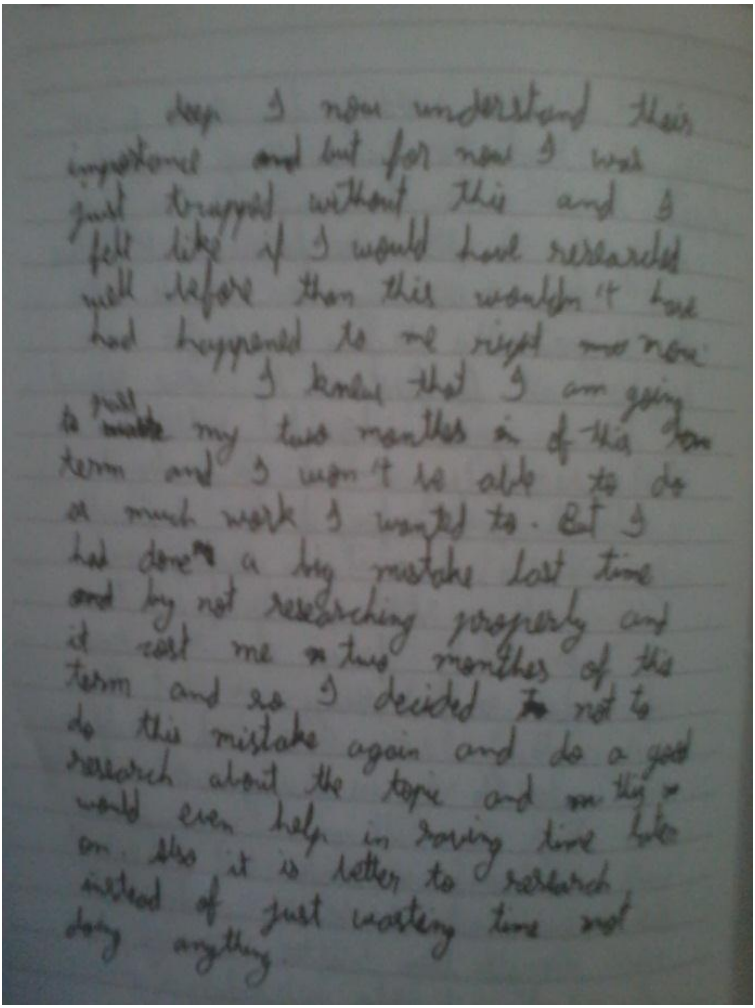
I used different softwares for programing and to load the program in the microcontroller and they are Keil compiler, Uniprog, Proload, and visual basic etc.

Appendices

I used some external materials which I would like to acknowledge and they are as given below

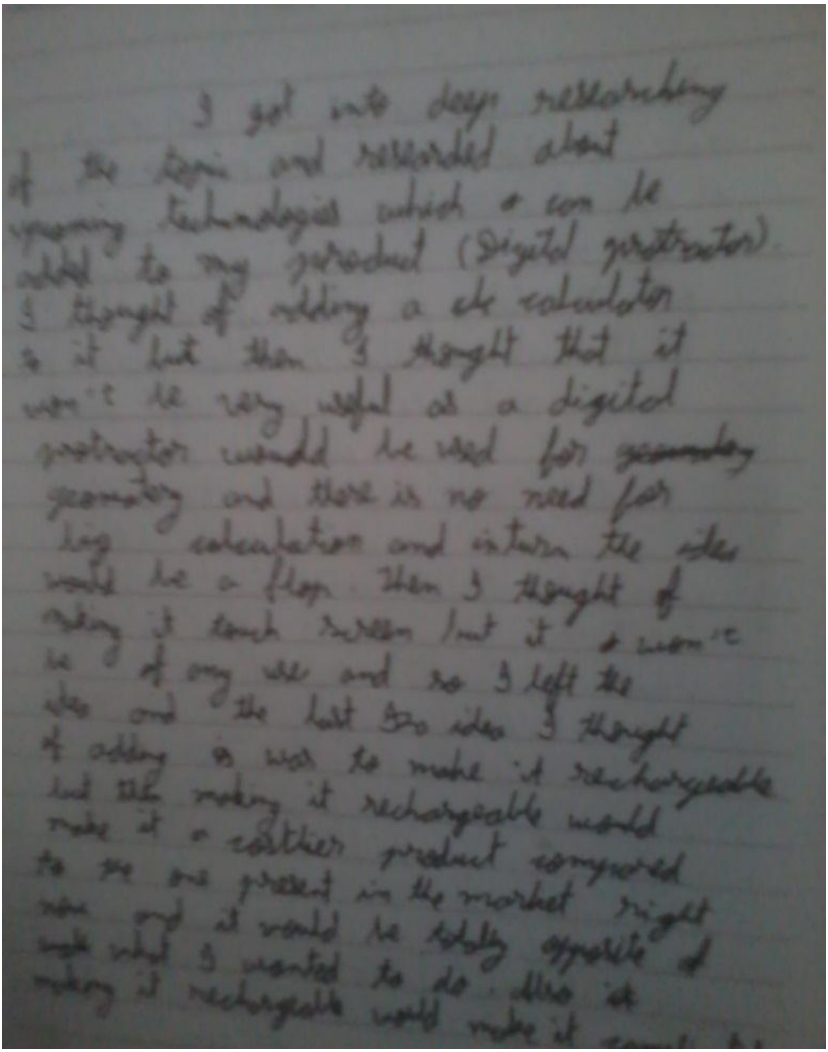
- ⇒ Classes at ‘Automation Engineers’ for about 15 days
- ⇒ Software like Uniprog, Proload, Keil compiler, Visual Basic etc.
- ⇒ Micro Controllers (8051 & PIC 16F676)
- ⇒ Circuit Components (Resistors, LCD, Capacitor, Battery etc.)
- ⇒ Video tutorials on internet
- ⇒ Help from teachers, friends & family members

Here are some pictures from my process journal



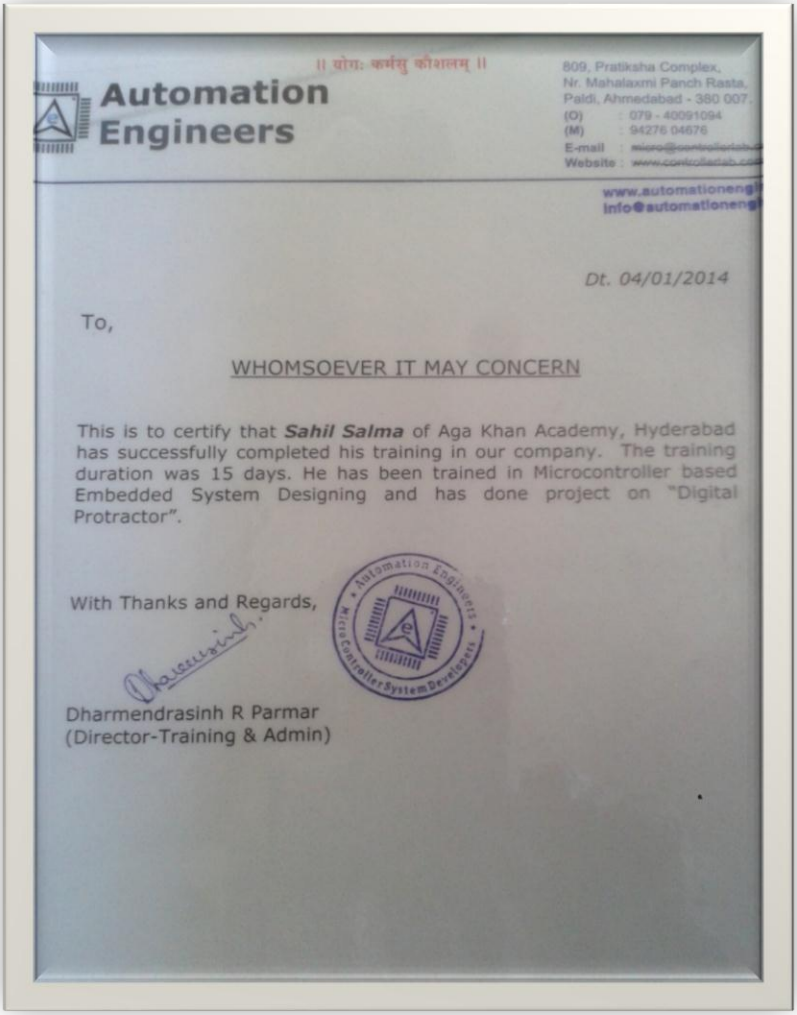
deep I now understand their importance and but for now I was just trapped without this and I felt like if I would have researched well before then this wouldn't have had happened to me right now.

I know that I am going to spend my two months in of this term and I won't be able to do as much work I wanted to. But I had done a big mistake last time and by not researching properly and it cost me two months of this term and so I decided not to do this mistake again and do a good research about the topic and on this would even help in saving time later on. Also it is better to research instead of just wasting time not doing anything.



I got into deep researching of the topic and recorded about upcoming technologies which can be added to my product (Digital protractor). I thought of adding a de calculator to it but then I thought that it won't be very useful as a digital protractor would be used for ~~geometry~~ geometry and there is no need for big calculation and in turn the idea would be a flop. Then I thought of making it touch screen but it won't be of any use and so I left the idea and the last two ideas I thought of adding is was to make it rechargeable but the making it rechargeable would make it a costlier product compared to the one present in the market right now and it would be totally opposite of what I wanted to do. Also it making it rechargeable would make it

Finally after this course about which I mentioned previously I achieved this certificate



॥ योगः कर्मसु कौशलम् ॥

Automation Engineers

809, Pratiksha Complex,
Nr. Mahalaxmi Panch Rasta,
Paldi, Ahmedabad - 380 007.
(O) : 079 - 40091094
(M) : 94276 04676
E-mail : micro@controllerlab.com
Website : www.controllerlab.com

www.automationengineers.com
info@automationengineers.com

Dt. 04/01/2014

To,

WHOMSOEVER IT MAY CONCERN

This is to certify that ***Sahil Salma*** of Aga Khan Academy, Hyderabad has successfully completed his training in our company. The training duration was 15 days. He has been trained in Microcontroller based Embedded System Designing and has done project on "Digital Protractor".

With Thanks and Regards,

Automation Engineers
Micro Controller System Developers

Dharmendrasinh R Parmar
(Director-Training & Admin)

I would like to give special thanks to the following people

⇒ My supervisor Mr. Sudipta for his support & advice

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⇒ My mother for supporting me throughout the year

⇒ Obviously IB and Aga Khan Academy for giving me this chance.