SUMMER INTERNSHIP REPORT

(SEM II)

Submitted in the partial fulfilment of the requirements of the degree of

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In

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By

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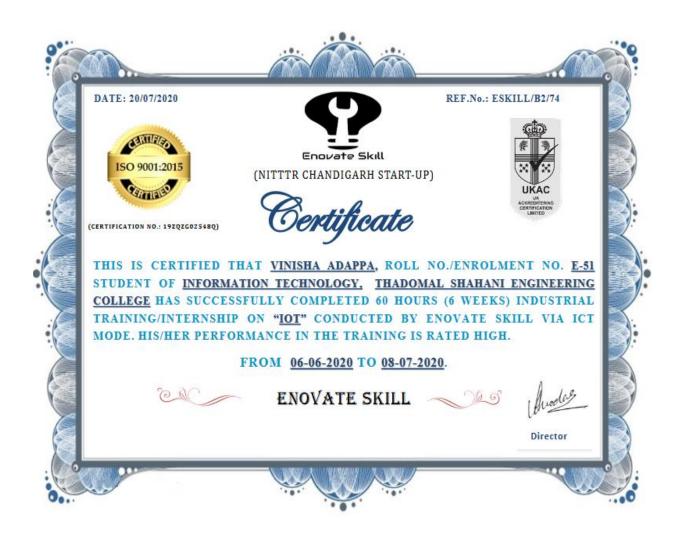2019-2020

CERTIFICATE

This is to certify that the "Internship report" submitted by Vinisha Vinay Adappa**, (Roll. No.: E-51**) is work done by her and submitted during 2019 – 2020 academic year, in partial fulfilment of the requirements for the award of the degree of **"BACHELOR of ENGINEERING"** in **"INFORMATION TECHNOLOGY"**, Thadomal Shahani Engineering College.

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Internship Certificate

DATE: 20/07/2020

REF.No.: ESKILL/B2/74

Enovate Skill

(NITTTR CHANDIGARH START-UP)

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THIS IS CERTIFIED THAT <u>VINISHA ADAPPA</u>, ROLL NO./ENROLMENT NO. <u>E-51</u> STUDENT OF <u>INFORMATION TECHNOLOGY,</u> <u>THADOMAL SHAHANI ENGINEERING COLLEGE</u> HAS SUCCESSFULLY COMPLETED 60 HOURS (6 WEEKS) INDUSTRIAL TRAINING/INTERNSHIP ON "<u>IOT</u>" CONDUCTED BY ENOVATE SKILL VIA ICT MODE. HIS/HER PERFORMANCE IN THE TRAINING IS RATED HIGH.

FROM <u>06-06-2020</u> TO <u>08-07-2020</u>.

ENOVATE SKILL

Director

Acknowledgement

The internship opportunity I had with Enovate Skill was a great chance for learning and professional development. Therefore, I consider myself as a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having a chance to converse with so many wonderful people and professionals who led me though this internship period. Even though the training was conducted on online portal, I am thankful that the instructor made sure there was two-way communication and all our doubts were heard and solved.

Bearing in mind previous I am using this opportunity to express my deepest gratitude and special thanks to the Co-Founder of Enovate Skill who took time out to explain all the concepts thoroughly and guide me on the projects provided and helping me out with all the doubts regarding the topic.

I perceive as this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement, in order to attain desired career objectives. Hope to continue cooperation with all of you in the future.

About Enovate skill E-Learning

"Enovate Skill" is a unit of Enovation Lab LLP, A Start-up of NITTTR(National institute of Technical Teachers Training and Research, Chandigarh) Under Minister of HRD, Govt. of India, alumni under the guidance of Dr. M.P Punia, Vice Chairman of AICTE, New Delhi (Former Director of NITTTR, CHD) & mentorship of Dr. Maityree Dutta, Prof.& Head Electronics & Communication department, NITTTR, CHD. Enovate Skill is working in the area of providing training and workshops on various aspects of technical education to fulfill the gap between Industry-Academia. They provide hands on workshop so that individual can learn things by doing as per future industry demand. The workshops are well designed as per the industry skill requirement. Their aim is to bring about change in Education system, working as a bridge between industry and institution by encouraging hands-on experience in their study. The company provides research support in Robotics, Renewable Energy, Green Vehicle Technology, Automation, Internship, and Consultancy for industry and Institution. They also develop custom e-Learning, design e-Learning templates, convert ILT to web-based training, convert Flash courses to HTML, and update and maintain e-Learning courses. Enovate Skill also offers instructional technology needs analysis, e-Learning strategy and curriculum design, mobile learning strategy and curriculum design, e-Learning authoring tool selection, and learning management system selection. They provide one-on-one coaching services to training professionals seeking to improve their instructional design and e-Learning development skills.

Problems and Opportunities

The seamless connections and vigorous integration with other technologies has enabled the IoT to be one of the promising technology that will change our lives. The applications of IoT in combating this global pandemic can be spread to several sectors which can play a major role in reducing the risk of coronavirus outbreak. Internet of Health Things (IoHT) is an extension of IoT, which aims to connect patients to health care facilities to monitor and control human body vital signs using communication infrastructure. Telemedicine is getting popular in remote areas where accessibility to a quality physician is limited due to different factors. Introducing AI algorithms to the IoT has opened new

doors in this area. AI provides opportunity of learning and extracting meaningful patterns from the data. As the data from IoT devices are aggregated in a database, it can be readily used in predicting the outbreak and effects of coronavirus and how to mitigate it.

Methodology

The summer training for IOT (Arduino and Raspberry Pi) was conducted through online portals due to the impact of covid-19 outbreak. The training was divided into multiple modules that were covered as per the schedule provided. Most common software that we used were TinkerCAD. Other software such as MIT App Inventor, SCRATCH, NODE Red and XY-Remote was also used for better understanding. TinkerCAD is an open source online collection of software tools that helps to create electrical circuits, 3-D models and hence id extensively used for online simulation for Arduino. MIT App Inventor is a web application IDE (Integrated Development Environment) which uses Graphical User Interface (GUI) which allows users to drag and drop visual objects such as button, label, text field, etc. to create an application that can run on android devices. Remote-XY is a website that allows easy development of a mobile interface through which multiple modules and devices can be controlled through mobile phones. The purpose of the training was introduction and implementation of important components in IOT and its significance in current day scenarios. The daily session started with explanation of the modules and then we were provided with the basic idea of the implementation. Also, all the simulations were carried out using the above mentioned software for better understanding and hence providing "hand-on" experience without actually having to use the hardware. We were provided with assignments and mini projects regularly to implement the explained concepts and get attuned with the working of different components and modules. Different type of modules such as Wi-Fi module and Bluetooth module and sensors such as Passive Infrared Sensor, Digital thermal sensor, etc. were covered in the training. Also, the basics of few programming languages such as Python, C were taught so as to facilitate the coding in the modules of the IOT. The training session was completed with an assessment that was carried out once the training was completed.

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Learning Objectives/ Internship Objective

The main objective of our internship on IoT was to introduce us to the latest trends and technologies in the domain of the Internet of Things. The purpose of the Internship training was to get exposed to real work of environment experience and at the same time, to gain the knowledge through hands on observation and execution. Moreover, the practical implementation of the project was carried out so that we can relate theoretical knowledge with its application in the IOT industry. The most important objective of the internship training was to provide firsthand experience with the hardware constituting IoT.

The objectives of internship are:
- To learn about Internet of Things thoroughly and to be able to implement it and build my own projects to help the society
- To develop my skills in the application of theory to practical work situations.
- To develop my skills and techniques directly applicable to my career.
- Internship will increase my sense of responsibility and good learning habits.
- To provide greater experience in the field to improve productivity.
- That internship programs will increase my earning potential upon graduation and provide experience for the same.
- To build the strength, teamwork spirit and be fluent in sharing my thought and ideas.
- To enhance the ability to improve my creativity skills and implement the concepts for creating a complete project.
- To have hands-on experience with the different components, get better understanding about IoT and learning different technical skills to widen the spectrum of job opportunities.

To have a good communication network with the other students and instructors and to understand the working of the things in the IoT sector

Weekly overview of internship activities-Week#1

	Date	Day	Name of the topic /Module
Week #1	06/06/2020	Saturday	Introduction to IoT and basic points to know while working with electrical circuits.
	09/06/2020	Tuesday	Basic electrical circuits using LEDs and introduction to TinkerCAD.
	10/06/2020	Wednesday	Voltage divider rule and more about circuits and introduction to transistors.
	11/06/2020	Thursday	More about transistors And circuits with transistors.
	12/06/2020	Friday	Application of voltage divider rule and using potentiometer and Zener diode and PIR sensor.

Weekly overview of internship activities-Week#2

	Date	Day	Name of the topic /Module
Week #2	15/06/2020	Monday	Introduction to Arduino and microcontrollers.
	16/06/2020	Tuesday	More about Arduino: Configurations, components etc.
	17/06/2020	Wednesday	Embedded **C** on TinkerCAD
	18/06/2020	Thursday	RGB, servo motor and Buzzer
	19/06/2020	Friday	Basic projects using Arduino and RGB, Buzzer and servo motor (piano, RGB led)

Weekly overview of internship activities-Week#3

	Date	Day	Name of the topic /Module
Week #3	22/06/2020	Monday	Ultrasonic Sensor and social distancing project(hands free Hand sanitizer)
	23/06/2020	Tuesday	Introduction to MIT app-inventor, small project of text to speech output in mobile phone.
	24/06/2020	Wednesday	Learning about Bluetooth module and introduction to RemoteXY app.
	25/06/2020	Thursday	Intro to relay, project about controlling Arduino through MIT app inventor.
	26/06/2020	Friday	Using Wi-Fi module in Arduino using RemoteXY.

Weekly overview of internship activities-Week#4

	Date	Day	Name of the topic /Module
Week #4	29/06/2020	Monday	Attiny (a low cost Arduino alternative)
	30/06/2020	Tuesday	Cloud application using RemoteXY and Cayenne
	01/07/2020	Wednesday	Introduction to Raspberry pi and its configuration, components etc.
	02/07/2020	Thursday	General commands for Raspberry pi
	03/07/2020	Friday	Introduction to Node-Red(blinking led) and applications

Weekly overview of internship activities-FINAL Week

	Date	Day	Name of the topic /Module
#FinalWeek	04/07/2020	Saturday	Discussion on application of IoT, real life projects and its overview
	08/07/2020	Wednesday	**Assessment**

Introduction:

The internship training was conducted by Enovate Skill E-Learning for Internet of Things (IoT). The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. IoT uses the power of data and provides valuable insights to the users which can be used to improve operational efficiency and productivity. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers.

An IoT system consists of sensors/devices which "talk" to the cloud through some kind of connectivity. Once the data gets to the cloud, software processes it and then might decide to perform an action, such as sending an alert or automatically adjusting the sensors/devices without the need for the user. But if the user input is needed or if the user simply wants to check in on the system, a user interface allows them to do so. Any adjustments or actions that the user makes are then sent in the opposite direction through the system: from the user interface, to the cloud, and back to the sensors/devices to make some kind of change.

IoT system has the following components which make it work more efficient:

Microcontroller: This acts as the brain of the system and processes the data received from the sensor. You can program the microcontroller to carry out specific functionalities. The most commonly used microcontrollers are Arduino Uno & Raspberry Pi

Sensors: These are electrical devices that can monitor specific values real-time. For example, DHT (Digital Humidity and Temperature) sensor tracks the temperature and humidity differences in the environment real time and send the data to the microcontroller. Other sensors include LDR (Light Dependent Resistor), Soil Moisture Sensor, PIR (Passive Infra Red) sensor, Water Flow sensor etc.

Wi-Fi Module: This facilitates the connection between the device and the cloud platform. The data will be sent to the cloud platform with the help of this module. The most commonly used Wi-Fi module is ESP-8266. Since Raspberry Pi has an inbuilt Wi-Fi module, you don't require an additional one to establish the connection.

Cloud Platform: The feature that differentiates IoT from other technologies is the way the data is handled. IoT facilitates the transfer of data onto the cloud for storage and analysis with ease. For this, you need to link the project with any cloud platform. ThinkSpeak IoT platform is the most commonly used cloud platform.

Actuators: These are the devices that perform a specific action upon receiving the commands from the microcontroller. Actuators like water pump, relay driver modules, DC motors to carry out variations actuations like irrigating a field, switching ON/OFF of devices etc upon programming.

We used various sensors, modules and microcontrollers while learning, we saw the various configuration in which an Arduino can be set, the types of Arduino and which will be most effective on different ideas. We made many projects virtually and got to know the about how Arduino along with IoT can be immensely useful in our daily life. TinkerCAD, the platform we majorly used for simulation, gave a real life like experience on how to operate this small micro controllers, transistors, sensors and communication modules.

Internship Discussion:

The Internship/Summer training started in the first week of June and was conducted on ZOOM because of the COVID-19 outbreak. The objective of the training was to provide us with the hands-on experience without actually having to use the hardware. The topics covered during the training session were related to IOT considering the need and demand for IOT in current day. The Internet of Things is the concept of connecting any device (so long as it has an on/off switch) to the Internet and to other connected devices. The IOT is a giant network of connected things and people – all of which collect and share data about the way they are used and about the environment around them. It includes modules and components such as Arduino, Raspberry Pi, Wi-Fi modules, Relay modules, simulating software, etc. The training covered a large spectrum of IOT topics. The training included detailed explanation about the components, the working of the different modules and need for these in the current day scenarios. Elaborate lectures were conducted to meet the need of the training and provide us with enough information required for working with the components. Since the students did not have access to the IOT toolkit because of the situation back then, the working of the components and the modules were explained using free online simulation software for better understanding.

The session started with understanding basic circuit diagrams and electrical concepts which were thoroughly explained using TinkerCAD for better and easier understanding. We were given related assignments like lighting a bulb, calculating the limiting resistance to complete on TinkerCAD. An introduction to transistor was provided and concepts like Voltage divider circuit and Current divider circuit were covered. In the later lectures, a detailed study was done on transistors since it constitutes a part of the Arduino Circuit. Other basic topics like Potentiometer and Zener diode was also taught along with the applications of the Voltage division Rule and introduction to PIR sensor's working. The following module of the training was related to microcontroller and Arduino. Arduino constituted the majority of the training because of its extensive use in the modern world because of its compatibility and compact build. We were made aware of different models of Arduino and significance and power of each of them. We predominantly worked with Arduino UNO and did the assembling and complete coding on TinkerCAD. All the

minute parts of the Arduino, difference between analog and digital I/O and use of PWM pins and reading input and embedded C (used for coding in Arduino) were intricately explained. Multiple project ideas were proposed to us that we could complete using the Arduino and the concepts explained in the lecture. We started with basic assignments such as blinking led bulb and doorbell buzzer. Once we were acquainted with the programming, assembling and working of the components, we were introduced to elaborate projects that can be used during Covid-19 such as Hand sanitizer dispenser using ultrasonic sensor, etc. Few other projects including Piano and Burglar Alarm were also understood and implemented on TinkerCAD. Modules such as Wi-Fi module, relay module, Bluetooth module were extensively taught and were a major part of most of the projects since it is used for wireless communication and connecting the apps or programs with the smartphones. The instructor also focused on the use of Arduino in the making of Smart Homes and provided basic notes for the same. Since, the use of Arduino is more extensive now-a-days, we were provided with comparatively more assignments for the same. Knowledge and skills to select application layer protocols and web services architectures for seamless integration of various components of an IoT ecosystem. Understanding and deploying various types of analytics on machine data to define context, find faults, ensure quality, and extract actionable insights was also learned during the internship.

Other than Arduino, we also used MIT App Inventor to develop few basic apps (like Talk to Me, Text to Speech) by following the bunch of steps provided by the instructor. First, we had to work on the front-end of the app and complete the layout of the app by dragging and dropping the required components on the designer screen. The following step was to code for the app using the built-in blocks provided in the coding section that facilitates easy coding. Built-in blocks are available regardless of which components are in the project. In addition to these language blocks, each component in the project has its own set of blocks specific to its own events, methods, and properties. Once completed with coding, the shareable link was created which was then opened on the mobile phone for emulating the app and hence, completing the app. Other testing assignment that we made was connecting Arduino UNO and Bluetooth Module for lighting an LED using the app made on the App Inventor. Brief introduction to relay module was given and projects

related to controlling Arduino using the MIT App Inventor via Bluetooth Module as well as Wi-Fi Module.

To get accustomed with the visual coding, we also used SCRATCH by MIT which is a programming language and community where one can create interactive stories and animations. Scratch along with Arduino can be used for mobile robotics by integrating the Arduino with wireless communication channel such as Bluetooth module.

Other software used was Remote-XY which is used to control Arduino using smartphone. It was used to implement the basic Arduino projects made during the training using the smartphones. It constitutes of ON/OFF button which acts like the switch to the Arduino. RemoteXY allows to develop any graphical management interface, using the control, display and decoration elements any combination thereof. We can develop the graphical interface for any task, placing the elements on the screen using the online editor. After the development of the graphical interface, we get the source code for the microcontroller that implements the interface. The source code provides a structure for interaction between the program with the controls and display. Thus we can easily integrate the control system into the task for which the device is being developed. One of the programming language called Cayenne was introduced for the purpose of implementation of few projects. It is predominantly based on Haskell and some things borrowed from Java. Few Cloud Applications using RemoteXY and Cayenne were also implemented during the sessions.

The training also included other modules constituting IOT. One of the other module that we were introduced to was Raspberry Pi. The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. The introduction to Raspberry Pi module included Basics of Linux for RPI setup and its configuration. Later, we were introduced to Python which is used in Raspberry Pi to connect the projects to the real world. Few of the basic projects we worked with were GPIO control programming using python. For instance, we controlled an LED connected

to GPIO17, wrote the code to read the state of a button connected to GPIO2 and also connected the LED and button together. The basic concepts and the coding were explained that were necessary to implement any efficient project using Raspberry PI. Projects such as Home and kitchen automation and their implementation using Raspberry Pi were briefly explained in the lectures.

Brief explanation to Node Red was provided, which is a programming tool for wiring together hardware devices, APIs and online services. It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single-click and, can be used to create JavaScript functions. The light-weight runtime is built on Node.js, taking full advantage of its event-driven, non-blocking model. This makes it ideal to run at the edge of the network on low-cost hardware such as the Raspberry Pi as well as in the cloud. Hence, introduction to Node Red provided a brief glimpse of JavaScript objects and events thus altogether providing greater insight into the multiple programming languages.

During the last few sessions, we discussed about possible project ideas that could be implemented by using the software, programming language and components covered in the training. A lot of project ideas for the pandemic were proposed that could be implemented with limited resources and at cheaper cost. The training was completed with an assessment that covered all the topics explored during the training. The wide range applications of Internet of Things and its implementation were also discusses. The basic and the most common application of IOT is smart homes. Different components of smart home were discussed so that we could implement few of them at personal level.

We were also briefly introduced to cheap micro controller options and Attiny to make cost effective projects. A wide variety of cost effective micro controllers were introduced in the session that could be used without having to compromise Most of the projects covered in the training were cost effectives and used cheaper yet effective hardware components. The main objective of the training was to be able to create cost effective projects that could be the used for the well-being of the people and the society. Most of the objectives were met during the training, despite the time limitation and other

restrictions

Over the span of the training, we were taught multiple programming languages and were introduced to considerable number of software. This contributes to the increased credibility and additional skill set. Also, working with different paradigms of programming languages further helped to figure out the significance of each language and their appropriate implementation. The training inculcated multiple technical skills as it covered a huge range of electrical engineering topics and also multiple aspects of Internet of Things. Since, the training included a lot of mini projects and assignments, it sharpened implementation and a bit of problem solving aspects of coding which is a necessary attribute of an efficient programmer. The training helped me to harness my technical skills by covering multiple aspects of it, programming languages and software proficiency.

The skills learned in the internship can help me as a student start to build a professional network that can be a resource for the student. A network can help a student make well-informed decisions about their career and connect them with other professionals or opportunities that will help a student achieve success in a field. This internship has helped me practice and improve my industry skills while also learning how to work.

This internship has helped me to gain in-depth technical knowledge of the Internet of Things. It has also helped me to enhance technical skills in real time environment. Besides this, it has also helped me to understand the area of interest and selection of an area of specialization.

Conclusion

On the whole, this internship was a useful experience. I have gained new knowledge, skills and met many new people. I achieved several of my learning goals. I got insight into professional practice. I learned the different facets of working from home. Related to my study I learned more about the scope of IoT in industrial world. There is still a lot to discover and to improve.

The internship was also good to find out what my strengths and weaknesses are. This helped me to define what skills and knowledge I have to improve in the coming time. It would be better that the knowledge level of the language is sufficient to contribute fully to projects. It would also be better if I can present and express myself more confidently. At last this internship has given me new insights and motivation to pursue a career in IoT.

Internet of things (IoT) – holds huge guarantee for speculation and advancement that will mean wide societal advantage and enhancements in innumerable parts of our lives. At its most essential, the Internet of Things is a mark for a future in which standard, ordinary things – from family unit machines to autos to mobile devices – are equipped with sensors and associated with the Internet to share their information. Seen all the more extensively, the IoT will offer ascent to a whole environment for interconnected devices, articles, frameworks, and information all cooperating. In this new world, most correspondences will be machine-to-machine (M2M), and there will be a nonstop trade of data between gadgets, sensors, PCs and systems.

While the potential for advantages in an IoT world are broadly perceived, various approach issues affect the IoT crosswise over business sectors and utilizations, for example, interoperability, protection, security and range accessibility, among others.