



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**STUDY AND DEVELOPMENT OF AUTOMATION DATA  
MANAGEMENT OF ARDUINO OHMMETER USING  
KEYSIGHT VEE SOFTWARE**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Electronic) with Honours.

by

**MUHAMMAD SYAZWAN HAKIMI BIN MOHD SUHAINI**

**B071510617**

**94116105731**

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING  
TECHNOLOGY

2018

**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

Tajuk: STUDY AND DEVELOPMENT OF AUTOMATION DATA MANAGEMENT OF ARDUINO OHMMETER USING KEYSIGHT VEE SOFTWARE.

Sesi Pengajian: 2019

Saya **MUHAMMAD SYAZWAN HAKIMI BIN MOHD SUHAINI** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. \*\*Sila tandakan (X)

SULIT\*

Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.

TERHAD\*

Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.

TIDAK  
TERHAD

Yang benar,

Disahkan oleh penyelia:

.....  
MUHAMMAD SYAZWAN HAKIMI BIN MOHD  
SUHAINI

Alamat Tetap:  
Jln Kemuning, Kg.Bkt.Kuching,  
45800 Jeram,  
Selangor.

.....  
IR TS MOHAMMAD 'AFIF BIN KASNO

Cop Rasmi Penyelia

Tarikh:

Tarikh:

\*Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

## Declaration

I hereby, declared this report entitled “Study and Development of Automation Data Management of Arduino Ohmmeter By using Keysight VEE software” is the result of my own research except as cited in reference.

Signature : .....

Author's Name : MUHAMMAD SYAZWAN HAKIMI BIN MOHD SUHAINI

Date :

## **Approval**

This report is submitted to the Faculty of Engineering Technology of UTeM as Partial fulfilment of the requirement for the degree of Bachelor's Degree in Electronics Engineering Technology (Industrial Electronics) with Honours. The Member of the supervisor is as follow:

.....  
(IR. TS. MOHAMMAD 'AFIF BIN KASNO)

## **ABSTRAK**

Laporan ini akan membentangkan kajian dan pembangunan Kajian dan Pembangunan Pengurusan Data Automasi Arduino Ohmmeter dengan menggunakan perisian Keysight VEE. Arduino Ohmmeter dicipta menggunakan Arduino untuk mengukur nilai rintangan dari perintang. Perisian VEE Keysight digunakan untuk merancang pengurusan data automasi di mana nilai rintangan adalah pemindahan automatik ke Microsoft Excel. Untuk mencapai revolusi Industri 4.0, pengurusan data automasi diumumkan di mana data boleh dipindahkan ke Excel secara automatik. Jadi, dengan melakukan projek nilai rintangan pengurusan data secara automatik dari Ohmmeter menggunakan Arduino, ia dapat membantu proses manual untuk diautomatikasikan. Projek ini adalah berdasarkan masalah yang dihadapi oleh syarikat-syarikat ASJ, di mana pekerja mereka secara manual memasuki nilai rintangan ke Excel untuk rujukan masa depan. Jadi, pengurusan nilai data rintangan automatik ini dapat membantu mengurangkan ketepatan, kesilapan manusia dan mengurangkan masa untuk proses berulang.

## **ABSTRACT**

This report will present the study and development of Study and Development of Automation Data Management Arduino Ohmmeter by using Keysight VEE software. Arduino Ohmmeter was created using Arduino in order to measure the resistance value from resistor. The Keysight VEE software is used to designed automation data management where the resistance value is automated transfer to Microsoft Excel. In order to achieve Industrial revolution 4.0 an automation data management was announced where the data can transfer to Excel automatically. So, by doing the project automated data management resistance value from Ohmmeter using Arduino, it can helps manual process to be automated. This project was based on problem that have been faced by ASJ companies, where their worker manually enter the resistance value into Excel for future reference. So, this automated data management of resistance value can helps to reduce accuracy, human mistake and reduce time for a repetitive process.

# **DEDICATION**

Thanks to everyone.

## **ACKNOWLEDGEMENT**

First of all, thanks to Allah S.W.T for giving me a good health and huge courage and strength to do this final year project from beginning to the end.

Secondly, I would thanks and give appreciation to my supervisor, IR. TS. Mohammad ‘Afif Bin Kasno for support, guidance, encouragement and helping me through my final year project during this two final semester of my study.

I also would to thanks my friend, who have helped me by sharing the idea, support me and giving their cooperation in order to finish my project. Last but not least, I want to thank everyone that help me directly or indirectly for finishing this project. Not forgotten, I would thanks my family for their pray and blessing.



# TABLE OF CONTENT

Table of Content	ix
List of Tables	xi
List of Figures	xii
<b>CHAPTER 1 : INTRODUCTION</b>	
1.0 Overview	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Objectives	2
1.4 Scope of Work	3
1.5 Report Structure	4
<b>CHAPTER 2 : LITERATURE REVIEW</b>	
2.0 Introduction	5
2.1 Six generation of data management	5
2.1.1 Zeroth generation: Record Managers 4000BC -1900	5
2.1.2 First Generation: Record Managers 1900 -1955	6
2.1.3 Second Generation: Programmed Unit Record Equipment 1955-1970	6
2.1.4 Third Generation: Online Network Databases 1965-1980	7
2.1.5 Fourth Generation: Relational Databases and client-server computing 1980-1995	10
2.1.6 Fifth Generation: Multimedia Databases 1995-	11
2.2 Related research of ultrasonic flaw detector transfer to PC.	13
2.2.1 Data Management for IoT and Industry 4.0 Applications	13
2.2.2 Data in Digital ultrasonic	18
2.2.3 Ultrasonic flaw detector high speed data transfer using USB	22
2.2.4 Automation of Measuring Temperature	28
2.2.5 Energy Meter Reading System using camera.	29
2.3 Comparison Table	30

<b>CHAPTER 3 :METHODOLOGY PROJECT</b>	
3.0 Introduction	32
3.1 Block diagram	32
3.2 Instrument	33
3.2.1 Arduino ohmmeter	33
3.3 Software	35
3.3.1 Keysight VEE	35
3.4 Flowchart	38
3.4.1 Overall project flowchart	38
3.4.2 Explanation of Overall project flowchart	38
3.4.3 Project planning flowchart	39
3.4.4 Explanation of project flow flowchart	40
<b>CHAPTER 4 :DISCUSSION &amp; RESULT</b>	
4.0 Introduction	41
4.1 Accuracy Arduino Ohmmeter	41
4.2 GUI and Software design	43
4.3: The time taken for manual record compare to automatic record	49
<b>CHAPTER 5 :CONCLUSION &amp;FUTURE WORK</b>	
5.0 Introduction	50
5.1 Conclusion	50
5.2 Recommendation	52
5.2.1 Internet of Thing	52
5.3 Work Potential	52
<b>REFERENCE</b>	53
<b>APPENDIX</b>	54

## **LIST OF TABLES**

2.3.1 Comparison between the related research papers	30
2.3.2 Advantage and disadvantage between the related research papers	31

## LIST OF FIGURES

2.1.4.1 simple airline reservation system	8
2.1.4.2 three set-hierarchies	9
2.1.4.3 Bachman diagram or an Entity-Relationship diagram.	9
2.1.4.4 All data and all relationships.	10
2.2.1.1 Belt and the material on the belt forward.	13
2.2.1.2 belt list with operational DATA	14
2.2.1.3 I4PML processes model for the maintenance.	15
2.2.1.4 CSH data model, deployment and rule definition.	16
2.2.1.5 CSH client app usage.	17
2.2.2.1 Data interface via serial interface RS232	19
2.2.2.2 Application software for documentation of test data.	20
2.2.2.3 application software for test data management	20
2.2.3.1 Ultrasonic flaw detector block diagram	22
2.2.3.2 FPGA program block diagram.	23
2.2.3.3: FIFO write waveform in GPIF	25
2.2.3.4: USB device driver flow chart	26
2.2.3.5: Waveform displayed on the PC screen	27
3.1 General block diagram for automation data management.	32
3.2.1 Connection of Ohmmeter circuit	34
3.2.2 Coding for Arduino	35
3.3.1 The VEE program coding to initialize Excel	36
3.3.2 The VEE program coding output in Excel	37
3.4.1: Flowchart of Overall project	38
3.4.3: Flowchart of project flow	39

4.1.1 connection of Arduino of Ohmmeter	42
4.1.2 resistance value for 220 ohm unknown 1k ohm known	42
4.1.3 resistance value for 2.7K ohm unknown 1k ohm known	42
4.1.4 resistance value for 220K ohm unknown 1k ohm known	43
4.1.5 resistance value for 220K ohm unknown 100k ohm known	43
4.2.1 The GUI for the system	44
4.2.2 The password is wrong, system shut down	44
4.2.3 The password is right, system can be started	45
4.2.4 the window to select the Excel file in order to record the data	45
4.2.5 the resistance value was displayed in GUI	46
4.2.6 show the Excel file that fill with resistance value	46
4.2.7 The calculation of X chart and R chart	47
4.2.8 the X chart	47
4.2.9 the R chart	48
4.3.1 time taken for automatic and manual record	49

# CHAPTER 1

## INTRODUCTION

### 1.0 overview

This section will give a briefly explanation about the project that been carried out. Moreover, this chapter also provided the user of some important content such as the background of the project, problem statement, objectives, scope of work and report structure.

### 1.1 Background

Data management assemblies typically save enormous rations of information representing the historical files of an association. These databases progress by means of addition. It is important that the ancient data and applications endure to work as fresh facts and applications are extra. The systems are in steady change. Indeed, most of the larger database systems in operation these days had been designed numerous decades ago and have advanced with technology. An antique idea of view helps to understand recent systems [1]. Automation and synthetic intelligence are change dealers in Industrial Revolution 4.0 that will make sure organizations of personnel redundant, varying them with new employees with the wanted skills or with technologies that do the job inexpensive. Gone are the days where students go to university or college to find out about for a diploma that will set them up with a job for life. With technological improvements, jobs with these three qualities are most probably to be computerized which is repetitive, primarily based on guidelines and involve limited or well-defined physicality [4]. In order to achieve Industrial Revolution 4.0 an automation data management was announced where the data can

transfer to Excel automatically. So, by doing the project automated data management resistance value from Ohmmeter using Arduino, it can help manual process to be automated. This project was based on a problem that has been faced by ASJ companies, where their workers manually enter the resistance value into Excel for future reference. So, this automated data management of resistance value can help to reduce accuracy, human mistake and reduce time for a repetitive process.

## **1.2 Problem Statement**

This project problem statement is based on the problem that has been faced by ASJ Components. This company is producing resistors and needs to measure the resistors' values to be recorded in Microsoft Excel. Their operators need to measure the resistors using a multi-meter and record them manually in Microsoft Excel. This company is looking for an automated data management system that can make the resistance values be recorded directly to Microsoft Excel.

## **1.3 Objectives**

- To study the related research of the project in order to gain information regarding the data automation management system
- To develop the automatic system using VEE to transfer the reading from the ohmmeter into PC and record it.
- To analyse the performance of the developed Keysight VEE system respectively.

## **1.4 Scope of work**

This project problem statement is based on the problem that has been faced by ASJ Components. This company is producing resistors and needs to measure the resistors' values to be recorded in Microsoft Excel. Their operators need to measure the resistors using a multi-meter and record them manually in Microsoft Excel. This company is looking for an automated data management system that can make the resistance values be recorded directly to Microsoft Excel.

By using Keysight Vee software and interface with an Arduino Ohmmeter, resistance values can be recorded to Microsoft Excel. The programming for Keysight Vee Software is designed to make resistance values transfer to a personal computer and save them in Microsoft Excel automatically. So, data in Microsoft Excel can be referred to in the future.



## 1.5 Report Structure

In order to give clear detail about this whole project, the study is already divide into five chapters which is introduction, literature review, methodology, result ,discussion and conclusion. Furthermore, all the five chapter shows that the logical step in order to understanding the whole project about. Other than that, it also is to gain the appreciation and evidence of the methodology is used for design the system.

Chapter 1: Firstly, this chapter will introduce the brief idea of the project and it also covers the overview of the whole project. Moreover, this chapter also including the synopsis of the project or the background, objectives, work scope of the project, problem statement and the outcome of this project.

Chapter 2: Secondly this project is about how to gain the information about this project. All the information about this project will be classified into several articles such as journal, book and some related relevant sources.

Chapter 3: Next, for this chapter it will cover all methodology that is taken and project implementation in order to achieve goal of this project. Other than that, the software and hardware technical details also explained in this chapter.

Chapter 4: After that, this chapter is very important for this project because it contains the development and implement of this project. Moreover, this chapter also gives many analyses in order to determine whether the objectives for this project are achieved or not. Furthermore, this chapter also covers the result of this project, theoretically and actual findings and the simulation of the software on the system.

Chapter 5: Lastly, this chapter is about the whole content of the thesis. This is because consists the references, discussion and all attachments also will be included for the future references and the most important part is included.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter is a guide for the user on the project as this section contains a few articles of related research of ultrasonic flaw detector data transfer to Personal Computer. It also has a brief explanation about the history of ultrasonic. The source of information is referred as references to the user in order to finish this chapter as well as the project. This information has been compiled from the relevant sources such as articles, journals, books and other related sources. The information of the related research has been studied to improve the knowledge as it help to guide the user in the project. For this chapter, many source as the reference that has been referred to finish this chapter successfully such as the articles, journal and more relevant sources. In addition, all the information that is related to the project is included in this chapter. All the useful information is collected and will be used as a guide to finish this chapter. Some information from the references that has been studied are about some major components and topic which related to this project as it will be useful for the project in both aspects software and hardware.

#### **2.1 Six Generation of Data Management**

##### **2.1.1 Zeroth generation: Record Managers 4000BC -1900**

The royal assets and taxes in Sumeria was described as the first known writing. A long history is keep record. From clay tablets to papyrus to parchment and then to paper, it was evolution of technology. Phonetic

alphabets, novels, ledgers, Libraries, paper and the printing press were an example in data representation. The information processing in this era was manual but it was great advance.

### **2.1.2 First Generation: Record Managers 1900 -1955**

In 1800, Jacquard Loom created the first practical automated information processing by producing fabric from patterns to be represented by punched cards. Hollerith used punched card technology in 1890, for each household has a record by his system. Binary patterns on a punched card is represent for each data record. A company was formed by Hollerith in order to produce equipment that recorded data on cards, sorted, and tabulate the cards. International Business Machines or IBM it was Hollerith's business. IBM supplied unit-record equipment for business and government between 1915 and 1960.

### **2.1.3 Second Generation: Programmed Unit Record Equipment 1955-1970**

In the 1940's and early 1950's, stored program electronic computers had been developed for scientific and numerical calculations. In same time, Univac had developed a magnetic tape that could store as much information that give improvements in space, time, convenience, and reliability was developed by Univac the UNIVAC1 was deliver to the Census Bureau in 1951 to echo the development of punched card equipment. Hundreds of records per second can be processed by these new computer, and the space occupied by the unit-record equipment can be fit in a fraction.

The key component of this new technology was a software easy to program and use it the reason why it make them a key of new technology. COBOL and RPG were the languages that use in order to easier to sort, analyze, and process the data. A file-oriented record processing model was provided by the software. Several input files was read sequentially by typical programs and produced new files was produced as output. The record-oriented sequential tasks is design by COBOL and several other programming languages in order to make it easy to define. The file abstraction to store these records, a job control language to run the jobs, and a job scheduler to manage the workflow were provided by an operating systems.

Capture transactions on cards or tape and collected them in a batch for later processing was called as Batch transaction processing systems. Once a day these transaction batches were sorted. A new master file was produce by merged the sorted transactions with the much larger database (master file) stored on tape. A report that was used as the ledger for the next day's business was also produced by master file.

#### **2.1.4 Third Generation: Online Network Databases 1965-1980**

Leaders in several industries began innovating with online transaction databases which interactively processed transactions against online databases in late 1950's. Enable online data access was a key for several technologies. The example of online data access were the hardware to connect interactive computer terminals to a computer evolved from teletypes, to simple CRT displays, and intelligent terminals based on PC technology. The specialized software to multiplex thousands of terminals onto the modest server computers of the day was provided by Teleprocessing monitors. The request messages from a terminal, quickly dispatched server programs to process each message, and then dispatched the response back to the requesting terminal was collected

by TP monitors . Batch transaction processing that performed background reporting tasks was augmented by online transaction processing.

Sub-second access to any data item was provide by online databases stored on magnetic disks or drums. Programs to read a few records, update them, and then return the new values to the online user was allowed by these devices and data management software.

A more powerful set-oriented record model was evolved from simple indexed-sequential record organizations. Two or more records is relate by this application. Some record types of a simple airline reservation system and their relationships was showed by figure 2.1.4.1.

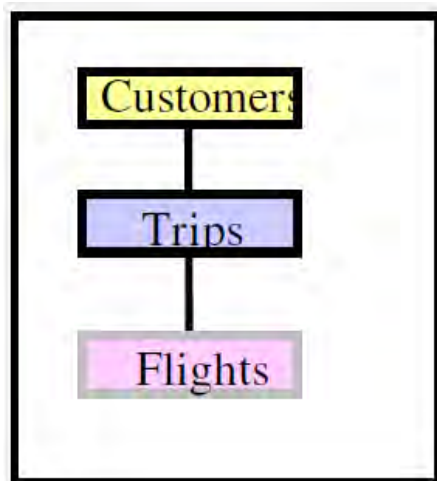


Figure 2.1.4.1: simple airline reservation system

A set of outgoing flights was has by each city. A set of trips was has by each customer, and a set of flights consists by each trip. In addition, a set of passengers was has each flight. In figure 2.1.4.2, three set-hierarchies was used to represent this information.

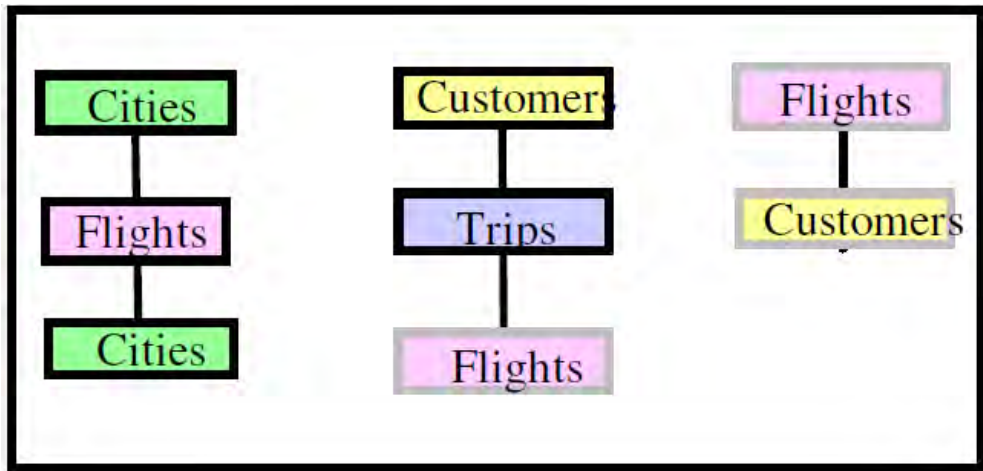


Figure 2.1.4.2: three set-hierarchies

Storing data redundantly is expensive. Problems which is when a flight is created or is altered the flight information must be updated in all three places (all three hierarchies.) is problem of storing data.

In figure 2.1.4.3, the information is represented with a network data model was created to solve these problems. A single database where each record is stored once was depicts in figure 2.1.4.3 and a set of other records is related by it through a relationship. Bachman diagram or an Entity-Relationship diagram was showed by figure 2.1.4.3.

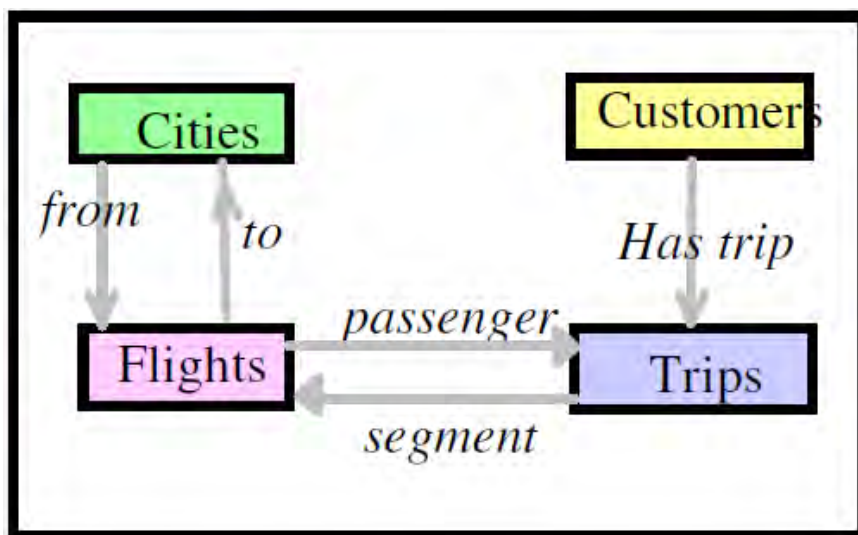


Figure 2.1.4.3: Bachman diagram or an Entity-Relationship diagram.

In figure 2.1.4.4 is all data and all relationships are explicitly represented as records which is described about the same information represented as in the relational model.

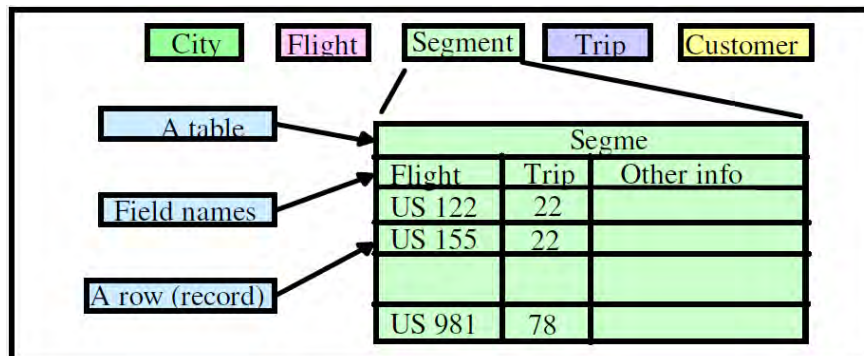


Figure 2.1.4.4: all data and all relationships.

The problem of running many concurrent transactions against a database shared among many terminal users was problems that online system need to solve. In order to eliminated concurrency and recovery problems, the single-program-at-a-time old-master new-master was designed .The concept of transactions was created to lock the records that was access is introduced as the concept of the early online systems. The set-oriented network (and hierarchical) data models were very popular in1980. Bachman is establish Cullinet, a company which is the largest and fastest-growing software company in the world.

### 2.1.5 Relational Databases and client-server computing 1980-1995

Represent both entities and relationships in a uniform way was an idea of the relational model. Unified language for data definition, data navigation, and data manipulation is a thing consists in the relational data model. The function of the relational data model and operators is to shorter and simpler programs to perform record management tasks. For example, in Figure 2.d show the airline database of the previous section that represented by five tables.

Application of Client-server was designed and divided in two parts applications. Responsible for capturing inputs and presenting data outputs to the user or client device was called as client part. Responsible for storing the database, processing client requests against a database, and responding with a summary answer was called as server. In order to minimize communication between client and server, SQL's high-level language was used. Provides a standard way for clients to make high-level requests to servers was the function of Open Database Connectivity (ODBC) protocol. Many client-server tools are built around it nowadays.

Graphical user interfaces (GUIs) also suited with relational data. Render a relation as a set of records – relations fit a spreadsheet metaphor was very easy by using GUI. Spreadsheet-like relations and can visually manipulate them can easily create by user. Relational data between documents, spreadsheets, and databases are moved using many tools.

Hundreds of thousands of people to pose complex database queries each day can be made by combined GUI and relational systems. Automatic-programming can be achieved by the combinations of GUIs and relational systems.

#### **2.1.6 Fifth Generation: Multimedia Databases 1995-**

Huge improvements in ease-of-use, graphical interfaces, client-server applications, distributed databases, parallel data search, and data mining was offered by relational systems the relational model was researched beyond by community in 1985. The separation between programs and data became problematic because of appearance of new applications. The data behaviour need to be given to application. “Applets” and “helpers” that capture, process, and render one data type or another was being built around Internet clients and servers. These applets was plug by user into a browser or server. The function of applets is manage sound, image, text, video, spreadsheets, and graphs .Many of the data was make desktops and web browsers as their ubiquitous sources