NORIMAH BINTI BA'EE

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RINGKASAN EKSEKUTIF

Alat menguji 'local area network (LAN)' telah menjadi bahagian penting untuk semua pengguna terutama sekali bagi pelajar system rangkaian dan juga orang teknikal dalam bidang menguji rangkaian. Tujuan projek ini adalah untuk membina alat menguji rangkaian yang mempunyai LCD dan murah tapi mempunyai spesifikasi yang hampir sama dengan alat menguji rangkaian yang mahal. Sistem ini membolehkan pengguna menguji status kabel, 'wiremap', status' error pin ' dan memberikan jalan penyelesaian untuk membetulkan kesalahan yang berlaku. Terdapat beberapa isu yang membawa kepada pembinaan projek ini. Antaranya ialah harga yang sangat mahal untuk system ini digunakan untuk pelajar rangkaian dan system yang sedia ada hanya menggunakan LED untuk menunjukkan status kabel rangkaian. Hal ini, menyebabkan pelajar tidak mengetahui detail tentatng status kabel tersebut. Projek ini dijangkakan akan mengurangkan kadar kos pihak universiti Malaysia Pahang dalam pembelian alat menguji rangkaian bagi kegunaan pelajar fakulti system computer dan software engineering (rangkaian).

EXECUTIVE SUMMARY

Tool test local area network (LAN) has become an essential part for all users, especially for students Ethernet network and technical people in the field to test the network. The purpose of this project is to build a network test tool that has an LCD and cheap but the specifications are similar to network test tools are expensive. This system allows the user to test the status of the cable, wire map, show error pin and provide some solution to solve the problem. There are several issues which led to the construction of this project. Among them is a very expensive price for this system is used for the student network and the existing system only uses LEDs to indicate the status of the network cable. It is, students do learn details about cable status. The project is expected to reduce the cost of the University Malaysia Pahang in the purchase of equipment for use in network testing student's computer systems and software engineering (network).

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CHAPTER 1

INTRODUCTION

This chapter will cover stage one proposal which have introduction, objective and scope of this project. The introduction include definition of the cable tester, some detail about specification need cable tester have and problem. While, problem statement will discuss about problem occurred using current LAN cable tester and user experiences. Next, scope of this project is including the location of experiments and programming language that will be use.

1.0 INTRODUCTION

Cable tester is a device that uses for checking strength and connectivity of cable assembly like a local area network (LAN) cable. This tester basically is used for subject local area network in Universiti Malaysia Pahang as core subject for student networking.

There are two types of tester in Universiti Malaysia Pahang which is Fluke cable network and pro basic tester. For Fluke cable network, it's very expensive device with the fully function but not all the feature is used for student LAN workshop learning. For example checking return loss, attenuation and others.

The second tool is pro basic tester which is the price is cheaper than fluke and this cable has more than one in lab, FSKKP. But this tool is not fully function. It's only have LED to show the status of cable and checking continuity. The problem of this device is it's cannot show the error pin if the cable is damage. If cable damage is plug in this tester, the LED will turn on and turn off not correctly. So, a student does not know where they make error on this cable.

The purpose of this project is to build LAN cable tester using ARDUINO mega as microcontrollers with graphic liquid crystal (GLCD) for display the result. Besides that, this project will reduce a lot of cost but the feature of this device more or less same with expensive tester tools. The example of the feature of this product is checking continuity of every type of cable which is straight through cable, cross over cable and rollover cable. It does also provide wire mapping to make sure the cable connect properly. Another feature is checking error pin and give some tips to troubleshoot.

1.1 PROBLEM STATEMENT

Faculty of Computer System and Software Engineering, University Malaysia Pahang is one off faculty that offer subject Local Area Network (LAN) where the students need use cable tester for testing UTP cable along this subject. So, there are only two types of tester tools which are occurred in LAB FSKKP, UMP. The first one is "fluke cable network" which is fully function but the price is very expensive, RM4469.90. But not this entire feature is used for student learning in local area network (LAN) workshop subject.

The second is pro basic cable network. This tester is only have LED to show result of the continuity. Students know the result by turn on or turn off the LED on the tester. But the problem of this tester is it's does not know the error pin if the cable tested is wrong cabling or crimping not good enough. This situation actually face by students when make a crimping cable in LAN workshop at many times.

Another problem on the cheaper tools is it's does not have LCD to make a wire mapping. As we know, the wire mapping is very important for making a LAN cable. So, when student apply lecture session in lab. They can prove the theory by seeing the result of the wire mapping which provided by tester.

1.2 OBJECTIVES

The main objective of this project is to design local area network (LAN) cable tester with the liquid Crystal Display (LCD) and using ARDUINO mega as microcontrollers. The objectives of this project:

i. To develop LAN cable tester to check type of cable which are straight cable, cross-over cable and rollover cable.

ii. To develop LAN cable tester to provided wire mapping and show error pin and provide tips to troubleshoot. Wire mapping is each wire is hooked up correctly, with no opens or shorts.

iii. To reduce the cost. This objective is to solve problem price for fully function tester which is fluke cable tester.

1.3 SCOPE

Generally, the primary goal of this project is to plan and modernize the network cable tester with Liquid Crystal Display (LCD). To achieve these goals, there are many scopes for this project. There are network installing and technique, hardware and electronic circuit basic and LCD programmable code.

The main scope of this project is about network installation and technique. In this project will focus on RJ45 cable. This project is designed for people who involve seriously in the network field. It is also an advantage for people who are just learning about the network installation. In University Malaysia Pahang, it will focus on students whose take subject local area network (LAN). In this subject, students will do some activity like make cable LAN and need to test and get the result. Using this network cable tester with LCD display will help them testing the cable's continuity

This project involves some technology on hardware and electronic circuit basic and the technique. The technology will use is LCD for display the status of the cable and show some tips to solve. This LCD also uses to make sure that the circuit had been designs are function need. Besides that, this project will use single microcontroller like Arduino to control all the transfer voltage.

LCD programmable code will be used in this project is the PIC16F877 are used in order to program the LCD display and to make sure that the circuit that had been designed are functioning as needed. The software involve in this process is PicBasic Pro and ICProg. This software is used to program the PIC.

1.4 THESIS OUTLINE

Part I:

Chapter 1 is included introduction, problem statement, objective of this project and scope of this project

Chapter 2 is about the existing system which is related to this project. It's also discuss about comparison between three existing system and its limitation. It's also discussed the feature and advantages of this system. This existing systems is been gathered from the websites and clients.

Part II:

Chapter 3 is about the methodology will be used in this project. It includes the diagram and flow chart. This phase also explain about the method will be used to build the LAN cable tester which is to enhance from the existing system and solve the problem. It's also discussing about the user requirements requirement that client expected from this project. This will include detail of the items that client need and confirmation from client.

Chapter 4 is about the result of testing for the project. These phases also explained about theory have been made during the developments.

Part III:

This part will be discussing about conclusion of this project and the cost. It also contains appendix and reference for this project.

CHAPTER 2

EXISTING SYSTEM

2.0 INTRODUCTION

This chapter will cover about existing systems that are occurring in university Malaysia Pahang which is my scope location for this project. This chapter will be covered three existing system that are pro-basic LAN cable tester, Cable IQ qualification tester and Easy Check 900 LAN tester/ Cable Tester and Kit. It also cover about problem that occur in this existing system and comparison for three existing system. This comparison will include all feature of the existing system.

2.1 EXISTING SYSTEMS

2.1.1 Pro-Basic LAN Cable tester

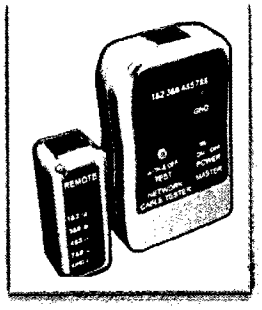

Figure 1: Pro-Basic LAN Cable tester

This cable tester uses an LED display to show the condition of patch cables and installed cabling. It test for faults such as open wires, shorts, reversed pairs, crossed pairs, split pairs and miss-wiring in seconds. The cable tester includes a push button which can automatically scan all wires and pairs to determine any existent faults. Besides that, it also can test the shields connection on shielded (STP) cabling.

Pro-basic LAN cable tester has another utility. There is one master and one remote unit. Detachable remote unit have some function. There are can test installed cabling and individual patch cords, tests the shield connection on shielded (STP) cabling, compact and easy to carry, easy to verify cable continuously, open, short, and miss wire. It also can test RJ45, RJ11 and RJ12.

This cable tester has some disadvantages. There is does not have LCD display for the status. So, user difficult to find the problem that display using LED only.

2.1.2 FLuke CableIQ Qualification Testers

Figure 2: FLuke CableIQ Qualification Testers

The cableIQ qualification tester is the cable which determines whether a cabling link based on its length, wire map, and signal performance should able to run 10/100, VoIP or Gigabit Ethernet. For example, this feature is use when we want to make sure that the existing cabling will support the bandwidth requirements of your network.

At the same time, qualification adds more powerful diagnostics and troubleshooting capabilities. For example, if the cable link cannot support the bandwidth requirement of the network, this cable tester will tell us about this problem which it provide detail information the nature and the location of fault.

Besides that, it also include feature of the discovers. This feature is use for detects what's at the end of any cable and display devices configuration such a speed, duplex, pairing. This feature can help user to know about configuration of the cable.

Next, this cable tester include identifies unused switch ports that can be reallocated. It's also provides graphically maps wiring configuration and shows distance to faults with intelligent wire map.

Lastly, this cable tester can test a several cable like twisted-pair, coax and audio cabling. It's also can save database up to 250 results. This database can review if anytime we need. The problem of this cable tester is high cost for the students learning even thought, it has complete feature.

2.1.3 Easy Check 900 LAN tester/ Cable Tester and Kit

Figure 3: Easy Check 900 LAN tester/ Cable Tester and Kit

This cable tester is compact, power full and easy to use. The cable tester include some feature like cable test, wire map test, tone generator, ping test, DHCP test, device ID test, link flash test, Net scan test and Voltage test.

The uses of cable testing are to quickly identify continuity such as shorts, open wires, reversed pairs, crossed pairs and miss-wiring. The cable length testing is using for measures cable each pair. This is very important because the maximum of LAN cable length is 100 m only includes cable that user use into the destination which is switch. Tone generation is use for cable tracing.

Next, device ID test is use for identifies what equipment is connected to the other end of the cable. For example, if voltage is found this and the likely connection type is reported on the LAN tester's display screen like power over Ethernet (POE). If no voltage is found are present, the Ethernet is reported like 10m/100m or 1000m, hub or NIC, auto MDI/MDI-x.

The ping and DHCP test is fast and effective networking testing is performed. This LAN tester can auto configures using DHCP then ping to an end point, plus ping the DHCP and DNS servers. It also have feature Net scan that allows identifying the number of devices on the Ethernet network and reporting their IP and MAC address.

The specification of this cable tester is support 10m/100m/1000m Ethernet RJ45, identify speeds duplex mode full or half, simultaneously pings three devices at once like a target,

a router and DNS server, display length measurements for each pair in feet or meters, full wire map cable tests with display of PASS, wire map and fault for opens, shorts, miss-wires and splits pairs.

This cable tester are support a several cable type like shielded or unshielded, CAT6, CAT5E, CAT5, CAT4, CAT3. It's also has LCD with backlight which this LCD is use for display status of cable and troubleshooting. Besides, its battery life can durable 50 hours for cable testing and no backlight.

The problem for this cable tester is very expensive to buy and use for learning. This tester is good if use for network engineer or maintenance because they need use this entire feature in their daily working.

2.2 Comparison between three existing system

	Pro Basic LAN cable tester	Cable IQ qualification	Easy check 900 LAN tester/ cable tester kit
Price ($)	50.00	1542.50	359.00
LED/LCD display	LED display only	LCD display only	LCD and LED display
Compatible	RJ45/RJ12/RJ11/STP	RJ45/RJ12/RJ11	RJ45/RJ12/RJ11
Support (gigabits)	-	100/10	10/100/1000
Battery life	-	-	Durable 50 hours and no back light
Measure length cable (M)	No	Yes	yes
Troubleshoot the problem/ network	No	Yes	No
Verify continuity	Yes	Yes	Yes
Database save	No	Yes Up to 250 result	No
Verify unused port to relocated	No	Yes	No
Graphically map wiring configuration	No	Yes	No
Easy to carry	Yes	No	No

Table 2.2: Comparison of the existing system

2.3 Explain the current systems limitation

The current system like pro-basic LAN cable tester have some weakness which is it cannot measure the length of network LAN cable, cannot know the problem that occur if the LED does not light, does not have return loss and problem delay. It only have feature which is test the wire map. If the wire map is not correct which is opens and shorts the does not light up while the wire map is in correct the LED will light up.

Wire mapping is the most important part since cabling but it does not enough if the wires mapping only that are tested. It is because, people does not know the others problem in case if the end user cannot access an internet. Some of this problem maybe occurred because of the LAN cable length. The maximum number of the LAN cable length is 100m only from the end user to switch. If LAN cable is more than that, some data will corrupt or not be sent to end user.

Besides that, this cable tester does not have LCD but its only use LED to display the result. So, the problem is user does not know the problem. They should think by yourself to solve the problem maybe occurred when LED show red light. For this task, they maybe take many times to find the problem. It will waste time because time for find the problem can be used for solve it.

The other of two current systems is good because it has many features to test the LAN cable but it's too expensive to buy. The price is around RM 120000.00 for each. For students learning, not all the features are used for the test. Its maybe use to know the status of the cabling which is wire mapping that include opens, shorts and continuity, measure the LAN cable length, troubleshooting and tips to fixed the problem and last is return loss.

2.4 Material outline

2.4.1 Hardware

Arduino Mega Uno 2560

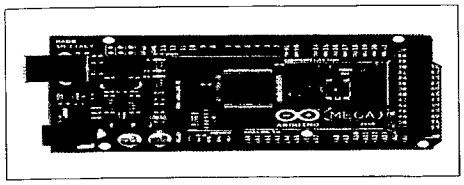

Figure 4: Arduino Mega Uno 2560

One of the important things of the devices is Arduino which is a microcontroller. There are many type of the Arduino but in this project the Arduino will be use is Arduino Mega 2560. The Arduino is to program the device which will operate by to what has been program. These devices are simply connecting it to a computer with USB cable or power it with an AC-to-DC adapter or battery to get started. It also contain hardware serial ports, USB connection, and a POWER jack, reset button and ICSP header. The Arduino can be stand-alone or it can communicate with software running on the computer like Flash, Processing, MaxMSP.

The advantages of the Arduino are inexpensive, cross-platform, open source software and hardware. The Arduino is inexpensive compare the other microcontroller platforms and it can assemble by hand. The price for one Arduino is below than RM200.00. Second is cross-platform, this hardware can run on many operating system. There are Windows, Macintosh OSX and Linux compare the other microcontroller system which are limited only to Windows. So, it's easier to do this project. Third, the Arduino programming is simple programming and flexible to any user whether beginner or advanced user. So, students which is has basic C language will be familiar with the look and feel of Arduino. The Arduino is open source of software; this software is published by experience programmers as open source tools. If use this device, the user can download the software at internet as free download.

128x64 Graphic LCD

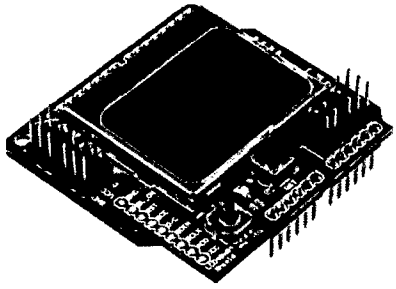

Figure 5: 128x64 Graphic LCD

LCD is stand for Liquid Crystal Display. There are many type of the LCD display which is common LCD, graphic LCD and other. In this system, the LCD will be use is Graphic LCD (128x64) because want to display clearly and make user easier to use this system. On the other hand, this LCD is inexpensive compare the other LCD display. The price is RM75.00. A graphic LCD is an electronic visual display used in different gadget and information-output sources, mostly in display screen electronic devices. This device are used for display status of the LAN cable, wire map matching, length of the cable, return loss and problem delay. It also uses to display instruction for the application and display some tips to troubleshooting the cable if it failed.

The advantage of this LCD is providing easier user interface for controls. Besides that, this LCD language support multiple language like Chinese character and English word compare the other LCD only support English character and it suitable for all people. This serial graphic LCD allows user to draw lines, circles and boxes, set or reset individual pixels, erase specific blocks of the display, control backlight and adjust the baud rate. The source code is open source

KEYPAD 4*4

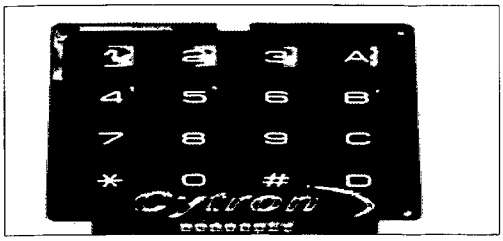

Figure 6: KEYPAD 4*4

Keypads play an important role in interrupt processing and modes of giving input to the microcontroller. This device is use for this system to control the application and it's cheaper which RM10.00 for one keypad. Each of this buttons will be play own function. Below is figure how keypad will be tide on microcontroller (Arduino Mega):

The advantage of this keypad is it provides a useful interface component for this system like 'B' for button 'back'. Besides, it's easy to communicate with any microcontroller and LCD or LED display.

RJ45 Female Jack (x2)

Figure 7: RJ45 Female Jack (x2)

This equipment is called RJ45 female jack which is used to become port of the RJ45 male plug. This equipment is used in this system because to check the LAN cable CAT 5 RJ45. This RJ45 is suitable not only for RJ45 but it also can use for RJ11.