Data Glass

Abstract: **In this project we build data glasses which can be used for hands free viewing of text sent via Smartphone. Arduino nano is used as it is compact and easy to code. Data is sent over a Bluetooth module using a smartphone. Oled is used to display the text on a mirror which is then reflected to an plano convex lens.The lens is used to enlarge the text that has to be displayed on the acrylic plastic sheet which will be placed in front of the eye. In this way the text is displayed.**

Keywords: Keywords—Mini Teleprompter; Arduino nano; Bluetooth module; Data glass; OLED; Smartphone application.

I. INTRODUCTION

Data Glass is an idea that all the useful information that is necessary is present directly in your line of sight without any extra efforts. This idea can be applicable to many things.

The basic concept of the Data Glass is that the microcontroller is interfaced with any device via the Bluetooth (HC-05) gets the information processes it, may it be a image or a text and displays it on the OLED. This image is then reflected via the mirror then magnified via the plano-convex lens and then finally it goes through a phenomenon called total internal reflection on the transparent acrylic layer. This image then can be visible through the acrylic.

This has multiple applications like –

i. Used as a mini teleprompter. This will display all the lines that need to be spoken during a presentation, meeting, etc.

ii. Date representation- It can be connected to a multimeter and then all the necessary data (voltage, current,etc) can be displayed.

II. SYSTEM ARCHITECTURE

It consists of a central microcontroller as shown in Fig.1. We have used Arduino Nano, this has been interfaced with a Bluetooth module HC-05 and a 0.96 inch OLED panel. The image that is displayed on the OLED can be virtually visible on the transparent acrylic panel. This happens cause of reflection from the mirror and then T.I.R. from the transparent acrylic panel. This image is also magnified using a plano-convex lens. This image can then be visible to the naked eye when the acrylic panel is placed at a right angle with the mirror.

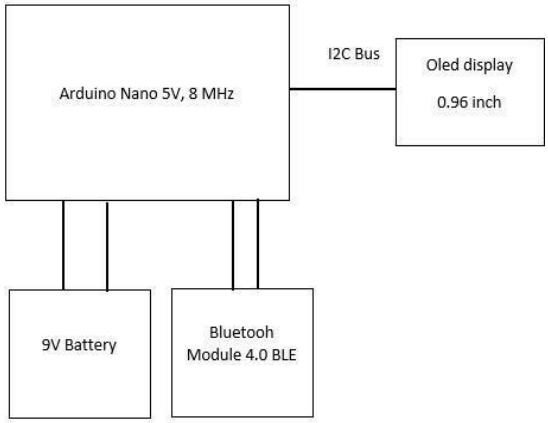

Fig.1. Overall system architecture

III. IMPLEMENTATION

This section consists of elaborate explanation about hardware components and software implementations.

A. HARDWARE COMPONENTS

The details description about the used hardware modules is presented as below:

i. The Bluetooth module(HC-05) as in Fig.2: is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm which is suitable for our compact design. We send data via HC-05 to the OLED using Arduino Nano.

i. The Arduino Nano as in Fig.2: is a small, complete, and breadboard-friendly board based on the ATmega328P. It also easy to connect to a computer with a USB cable and hence easy to code as well using the Arduino software.

ii. OLED (0.96") as in Fig. 2 : is an electronic display module commonly used in various devices and circuits. These modules are preferred over seven segments and LCDs as it is compact and consumes less space. This module display is economical, easily programmable and have no limitation of displaying special and even custom characters, animation and so on.

Battery (9V) as in Fig. 2: The nine-volt battery, or 9-volt battery, is a common size of battery that was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in walkie-talkies, clocks and smoke detectors. The nine-volt battery format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulphide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion.

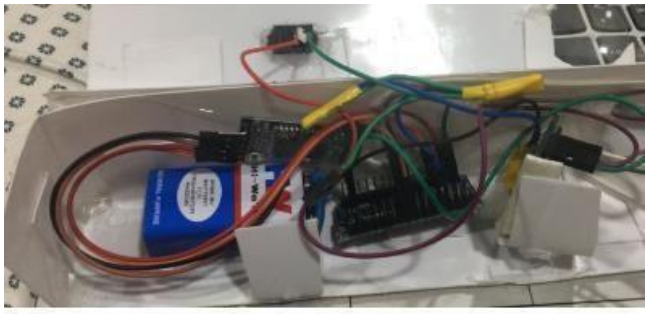

Fig 2. Hardware Implementation

iv. The Lens, Mirror and Transparent Acrylic is arranged as shown in Fig.3 The image that comes from the OLED panel is first reflected from the mirror then it is magnified using the plano convex lens, placing the OLED between the focal point of the lens and twice the focal length of the lens (between F and 2F).

1 / f = 1 / p + 1 / q

This formula helped us to find the focal length which was 10.5cm for our lens.

After the magnification, the image goes through total internal reflection (it is phenomenon which occurs when the angle of incident to the transparent surface is creater than the critical angle.

One thing to note is that the angle between the mirror and lens should be 90 degrees for it to be visible perfectly.

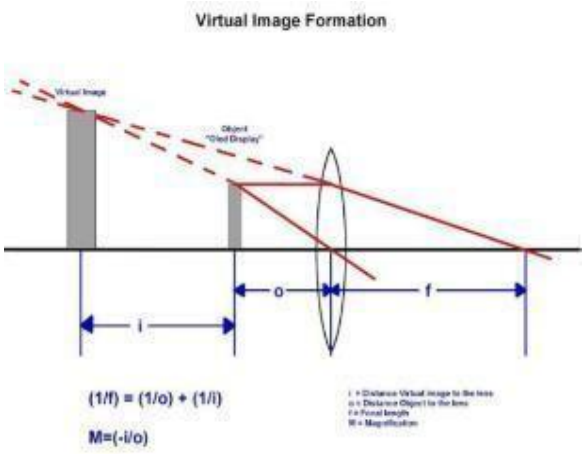

Fig.3 Focal length measurement

B. SOFTWARE AND ANDROID APPLICATION PLATFORM

Bluetooth Terminal as in Fig. 4a: One-of-a-kind App that gives you compatibility with all microcontrollers. All you need is a HC-05 serial adapter connection with serial ports of the controllers. - Control any Micro-controller that uses a Bluetooth Module HC 05 or HC 06 through your smart phone. - This app can send and receive commands easily. The user just need to download it on their smartphone to send data to the data glasses.

Arduino IDE as in Fig. 4b: A software that is used to program the Arduino Nano which contain many type of module libraries. These libraries are needed to program and make the module hardware operate correctly via Arduino Nano based on the coding that is programmed by this software.

Fig 4a. Bluetooth Terminal App

```
Plan_B
#include<SoftwareSerial.h>
#include<SPI.h>
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#define OLED_RESET 4
Adafruit_SSD1306 display(OLED_RESET);

SoftwareSerial Bluetooth (5,6);
void setup()
{
 Wire.begin();
 display.begin(SSD1306_SWITCHCAPVCC, 0x3C);// initialize with the I2C addr 0x3C (for the 128x32)(initializing the display)
  Serial.begin(9600);
 Bluetooth.begin(9600);
 pinMode(7,OUTPUT);

 pinMode(5,INPUT);

}
void displayreading()
{
  if(Bluetooth.available()>0)
   {
  String val=Bluetooth.readString();
  Serial.print(val);
   display.clearDisplay();
 display.setTextColor(WHITE);
 display.setCursor(0,10);
```

```
 Wire.begin();
 display.begin(SSD1306_SWITCHCAPVCC, 0x3C);// initialize with the I2C addr 0x3C (for the 128x32)(initializing the display)
  Serial.begin(9600);
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 pinMode(7,OUTPUT);

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}
void displayreading()
{
  if(Bluetooth.available()>0)
   {
  String val=Bluetooth.readString();
  Serial.print(val);
   display.clearDisplay();
 display.setTextColor(WHITE);
 display.setCursor(0,10);
 display.setTextSize(1);
 display.print(val);
}
}
void loop()
{
 displayreading();
 display.display();
}
```
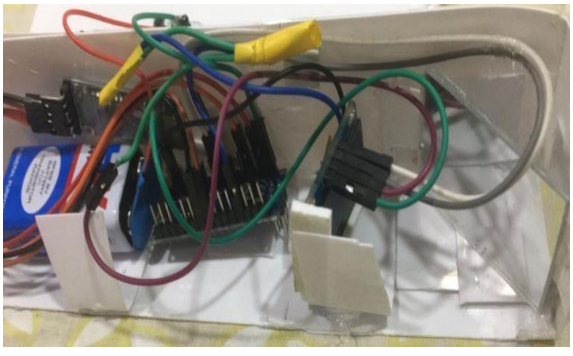

Fig 4b. Software Application

IV. RESULTS AND DISCUSSIONS

After successful implementation of the data glasses, the results are as follow:
The final prototype is shown as the figure 5a&5b

Fig 5a



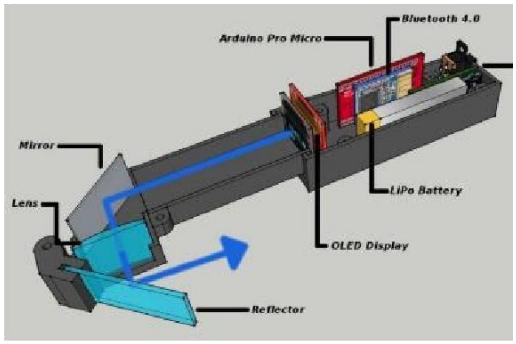


Fig.5b
Figure below Fig 5c shows the display on data glass

Fig 5c
Testing in data glass: Fig.5d below shows the OLED display the data from Bluetooth terminal app. The OLED act as the indicator of the message which user actually reads.The oled display from input to the app is shown below.

Fig 5d

V.BOM GENERATED

Sr. No.	Description		
	Items	Quantity	Total Cost
1.	Arduino Nano	1	500
2.	9V battery	2	100
3.	HC-05 Bluetooth module	1	250
4.	0.96 OLED	1	250
5.	Jumpers	6	50
Total			1150

VI. CONCLUSIONS

As conclusion, this system is designed to develop a system that can help people as a teleprompter device. This feature can make stage communication convenient and have other media applications. The information will be shown to the user's smart glasses through the android smartphone . Speakers can be prompted their line without having to depend on reading from paper. Furthermore, this project can also be used as a spy gadget with a few modifications. Besides, this friendly user system can produce the information typed which can prevent from user speaking the wrong sentences. It is a smart way to communicate a message which isn't actually spoken aloud and also budget friendly.

VII.REFERENCES

http://www.instructables.com/id/Arduino-Data-Glasses-for-My-Multimeter/