Blind Audio Guidance System

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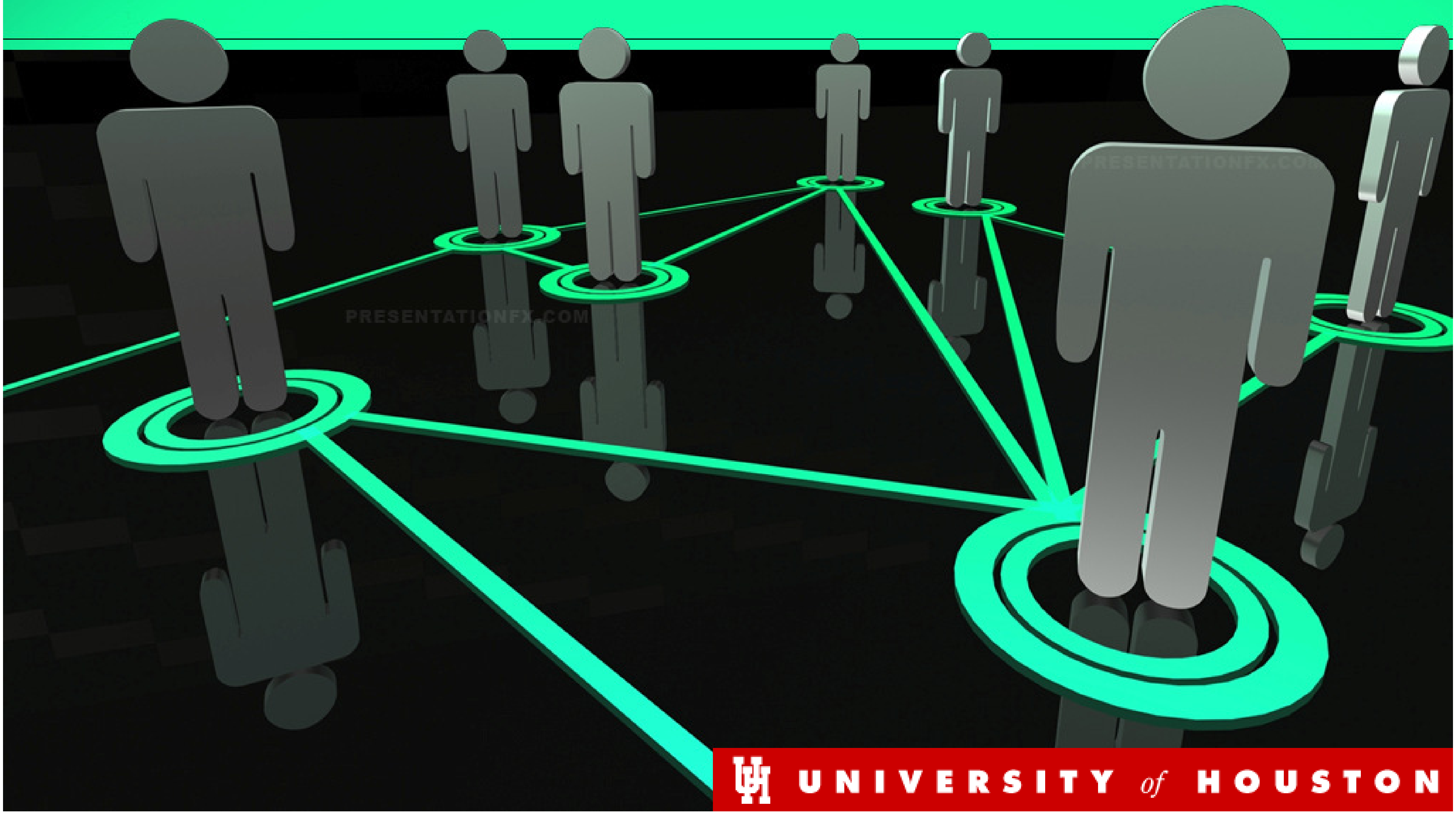

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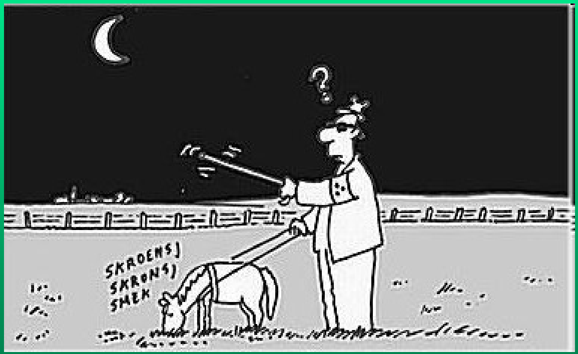
Outline

Blind Audio Guidance System

Introduction

- There are approximately 21.2 million blind or visually impaired people in the U.S. alone.
- Currently most blind people rely on other people, dogs, and their canes to find their way in buildings.
- This can be a hassle for both the visually impaired person as well as others.
- Many disabled people prefer to do things independently rather than rely on others.
- The Blind Audio Guidance System can provide a solution to this problem.



Background

Current Patents and Existing Technologies:

- **Smart Canes** – provide obstacle detection
- **Sonar vision glasses** – also may provide obstacle detection
- **GPS navigation systems** – provide directions, but not reliable or accurate enough for use in buildings

The Blind Audio Guidance System would allow navigation inside of buildings.

Project Objectives

- The main goal of the project is to provide a cost-effective way to allow buildings to support blind people.

- The Blind Audio Guidance System hopes to allow visually impaired users to simply press a button, speak the desired destination, and be guided there with the use of audio instructions.

- The system hopes to provide a portable unit that can easily be carried and operated by a visually impaired user. It could easily be incorporated into a walking cane.

Design Possibilities

Many different design possibilities were explored during research.

- **Wireless Sensor Networks** – Due to the high amount of sensors required for large buildings, this may be impractical, especially when user direction must be tracked. Programming would be much more complex.

- **RSSI Techniques** – This can be effective at finding distances base on signal strength but is also affected by the direction problem.

- **RFID** – Seems to provide the most cost effective and simplest way to determine direction using the technique that the team has developed. The programming using this technique would also be less complex.

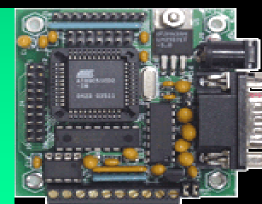
Challenges

- Low cost RFID readers have a short read range.
- Long range readers require more power and cost much more.
- Portability is difficult if high power is needed.
- RFID tag reads and read ranges may be inconsistent.
- RFID cannot inherently determine direction of approach.
- Speech recognition may be problematic due to unwanted noise and false reads.

Project Description

Major Hardware Components:

•MINI-MAX/51 Microcontroller

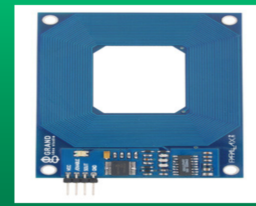


•EMIC Text-To-Speech Module

•SR-07 Speech Recognition Kit

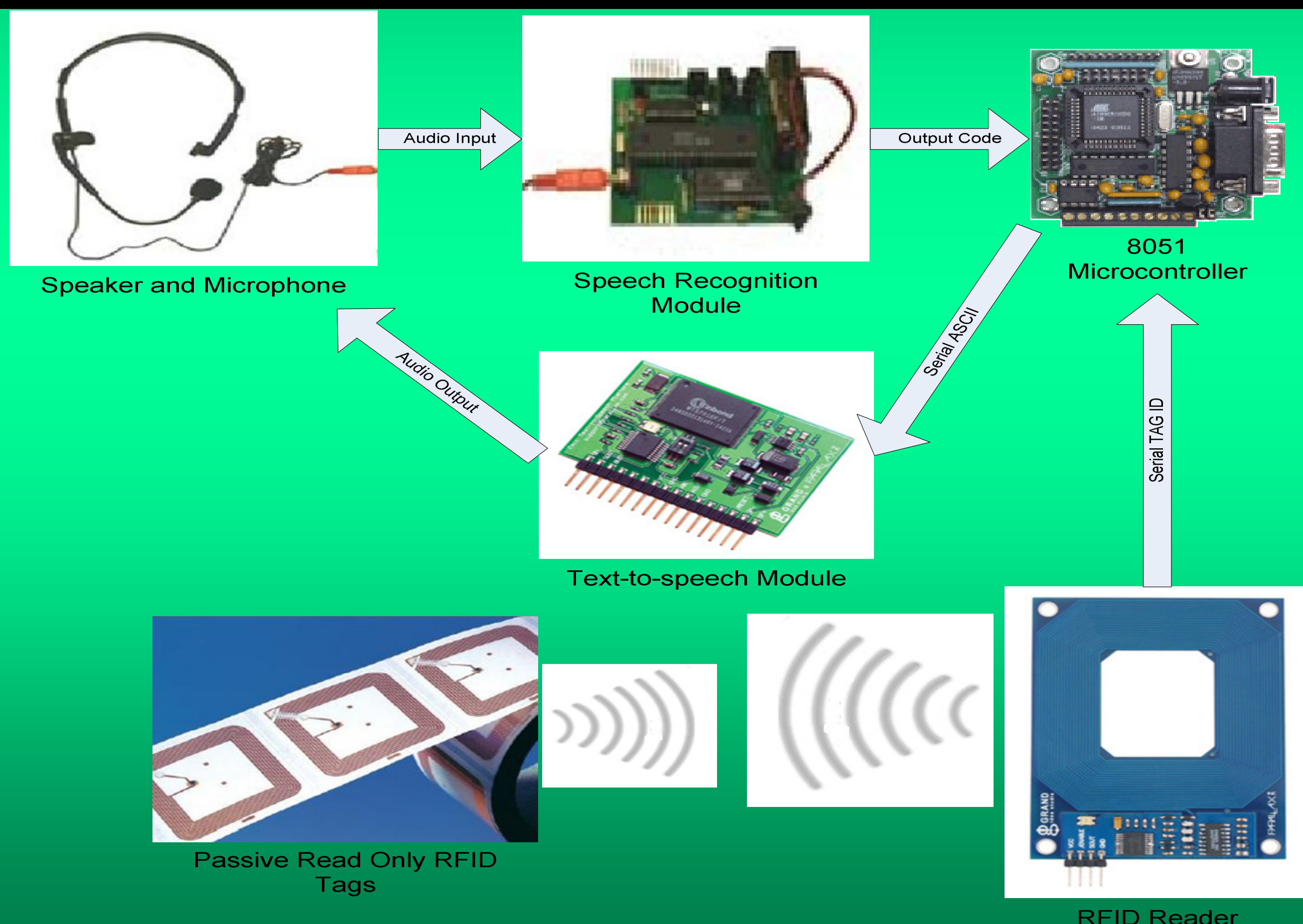
•Headset (microphone/speaker)

•Parallax RFID Reader

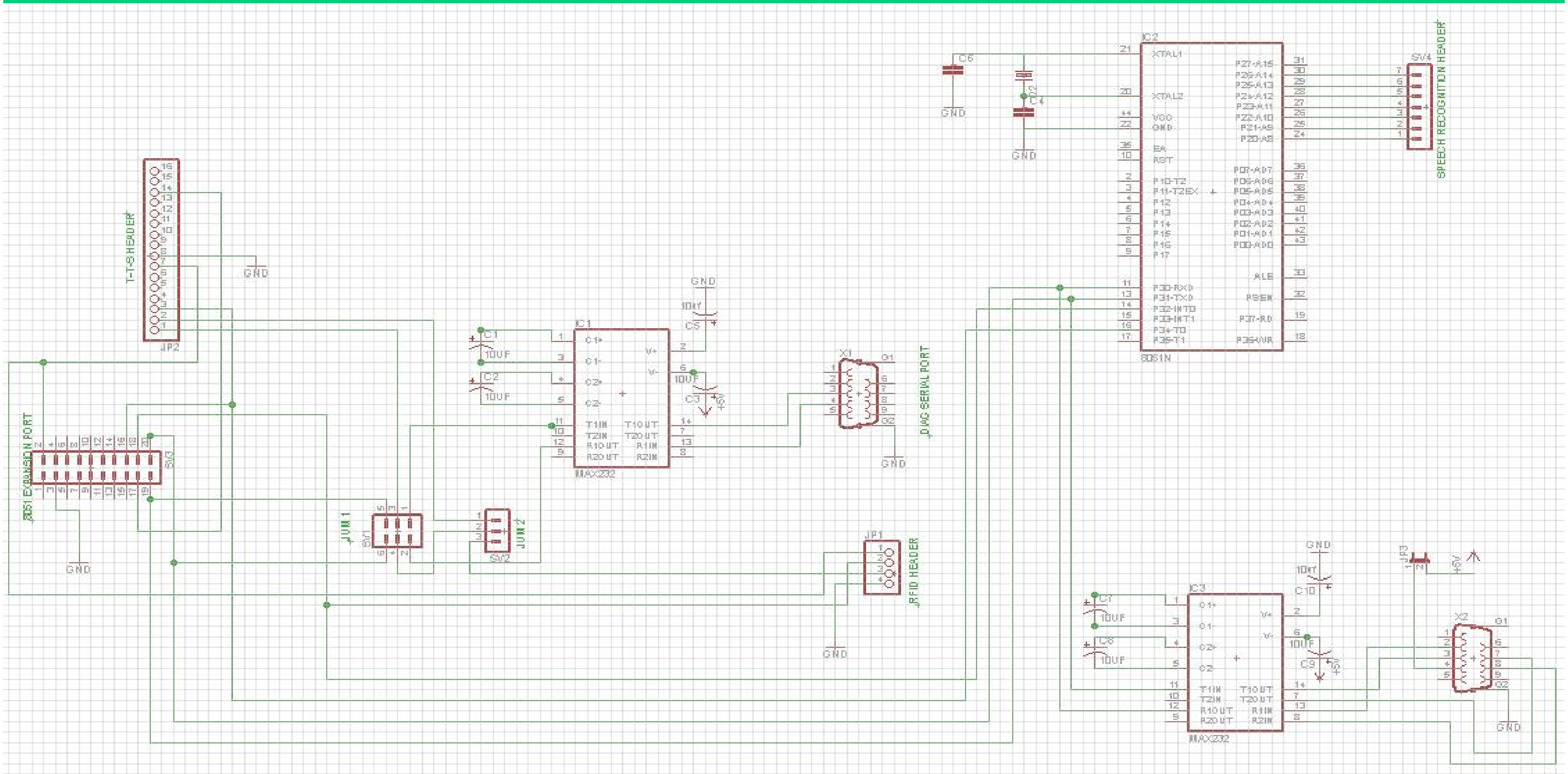


Block Diagram

Blind Audio Guidance System: Slide 7



Circuit Schematic



Powering the Device

The Blind Audio Guidance System is clearly a device that would need to have the ability to be powered for a sufficient amount of time throughout the day.

- Team 11 has decided to use a 6v 10,000mAH Ni-MH (nickel metal hydride) battery pack to power the device.

- Unlike Ni-Cd (nickel cadmium) batteries which are the most commonly used batteries in the world for devices such as remote controls, flash lights, RC cars etc; Ni-MH batteries have higher capacities than Ni-Cd, better discharge rates, and are not affected by the "memory effect".

Powering the Device contd

- Calculations
- **RFID -** 10mA idle 100mA active
- **8051 -** 50mA
- **Text to speech –** 70mA
- **Speech recognition –** 70mA

- The above are the amps drawn from each component that are assembled together to make the Blind Audio Guidance System. The following is a theoretical calculation of how long team 11's 6v Ni-MH 10,000mAH will power the device.

- **Worst Case Total Amps Used –** 290mA
- **Battery –** 10,000mAH

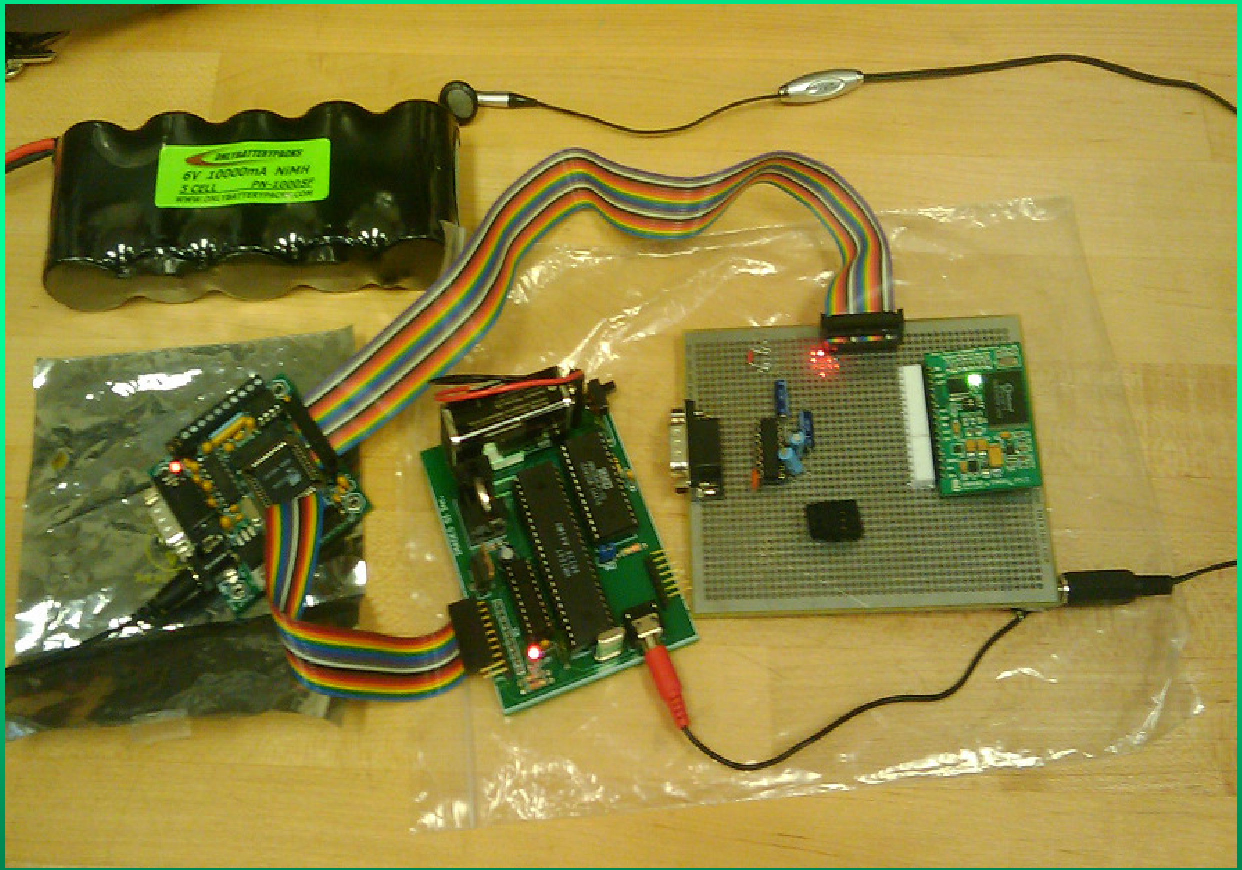
- *Battery capacity (milliamp hours) / total current (milliamp) = battery life (hours)*

- **Theoretical Battery Life –** 10,000mAH / 290mA = **34.48 Hours**

- This clearly is more than acceptable for the amount of time that the device will be able to operate. Team 11 decided to go with a little more milliamp hours than necessary for the convenience to allow a blind individual to possibly use the device two to three days without the need for a recharge.

Initial Construction

Blind Audio Guidance System: Slide 11



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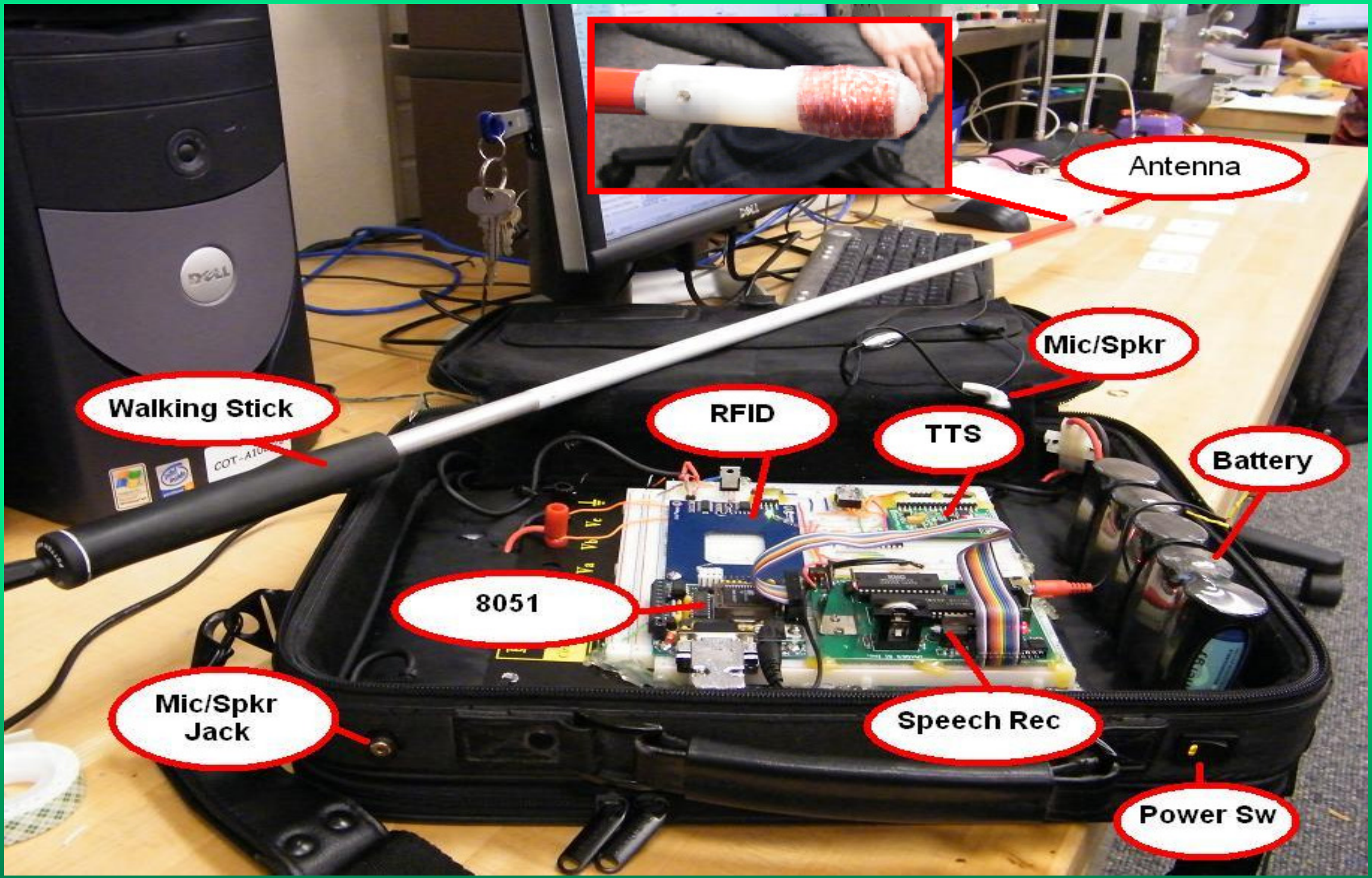
Final Circuit

Blind Audio Guidance System: Slide 12

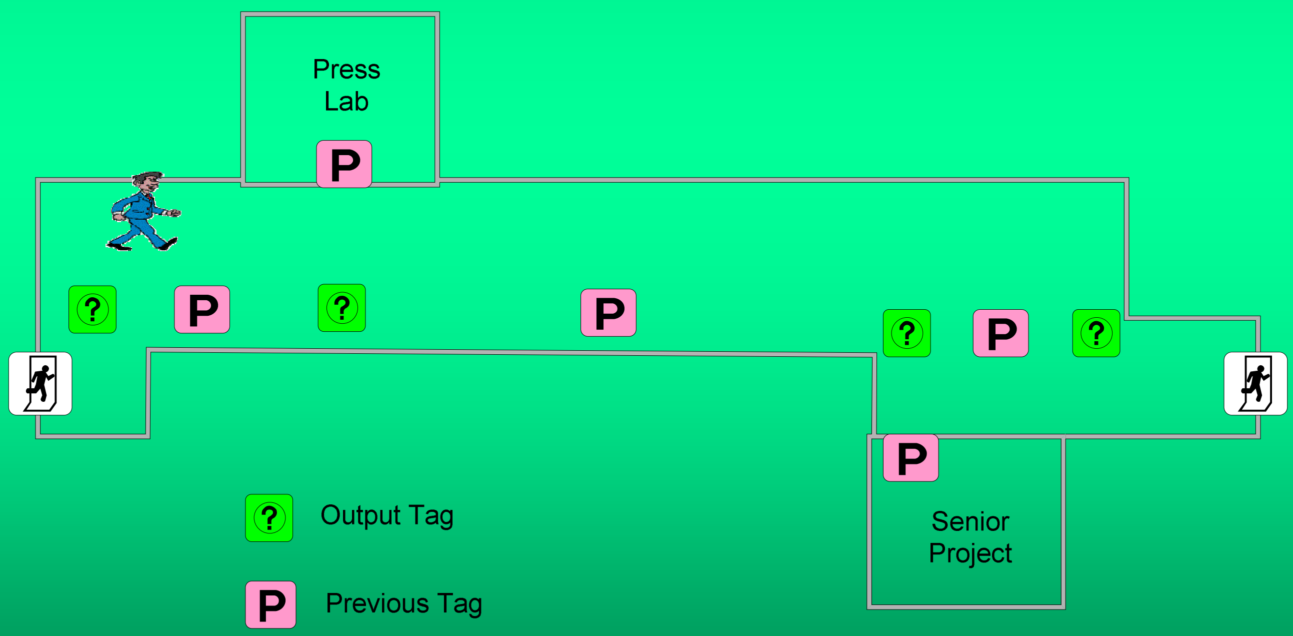


Final Prototype

Future Final Product

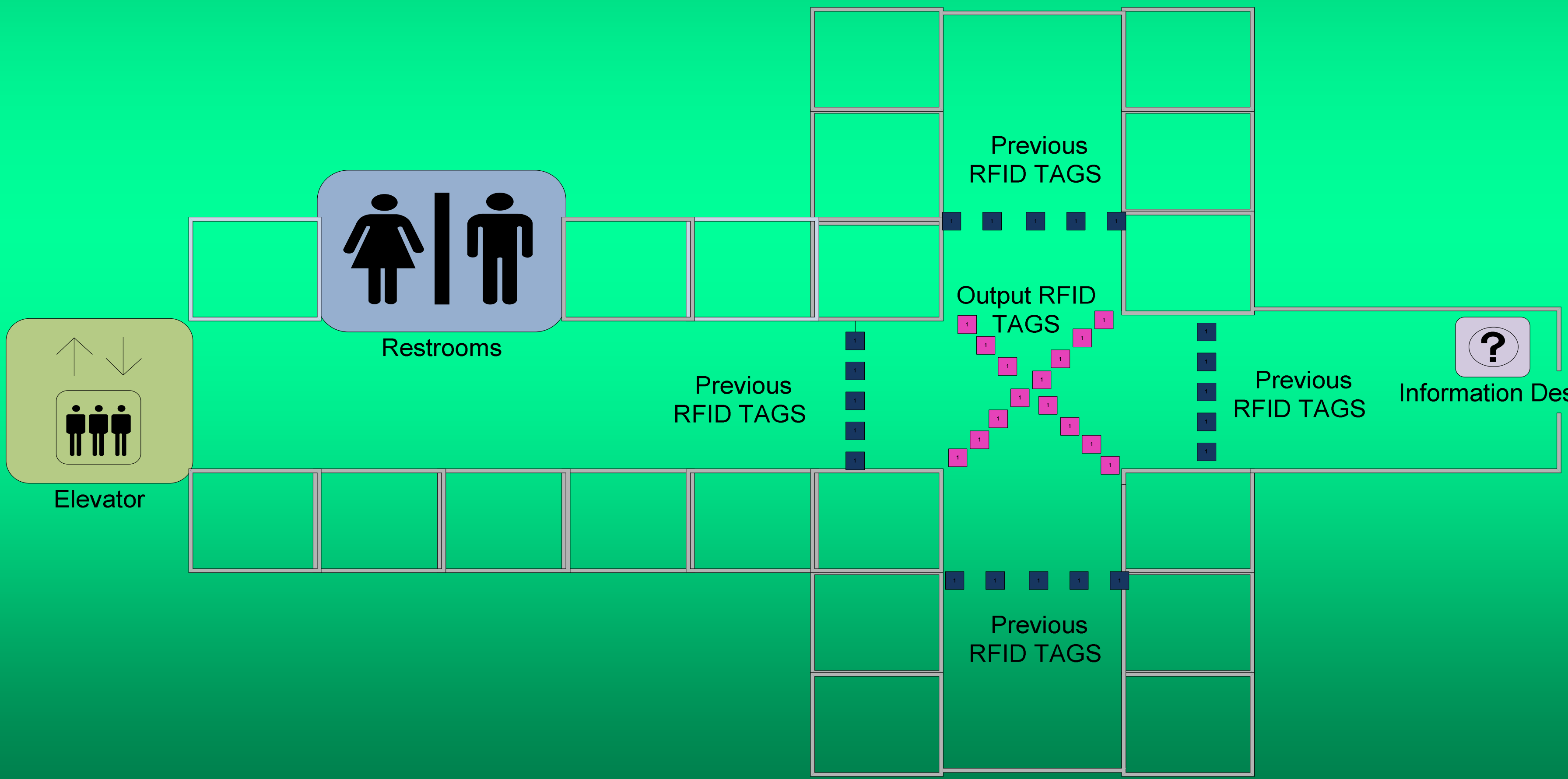
Actual Demonstration

Blind Audio Guidance System: Slide 15



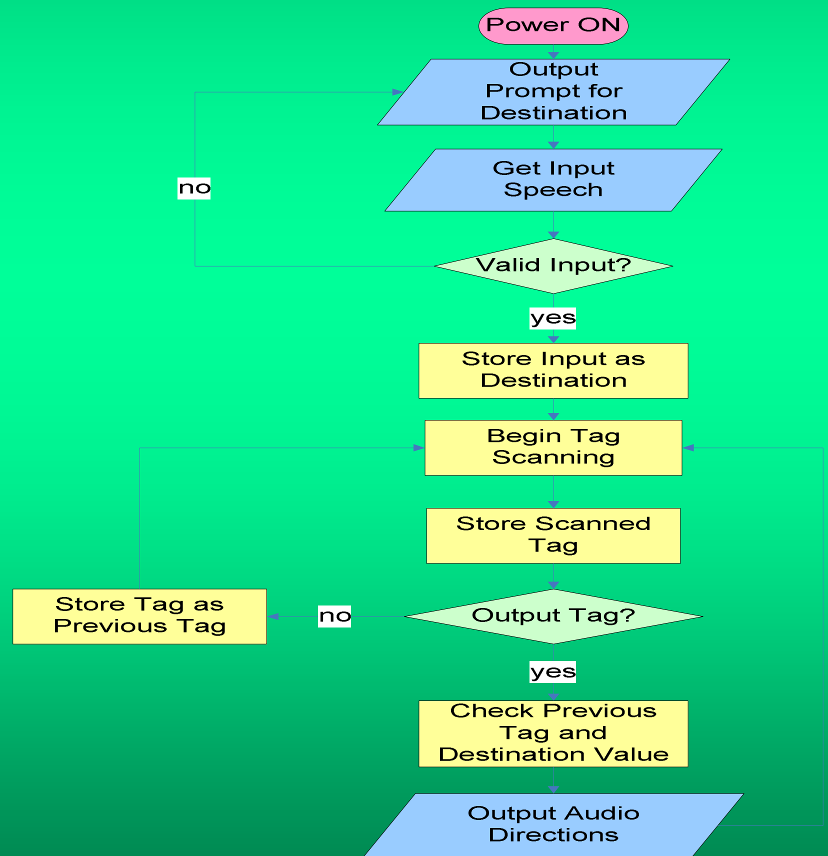
Building Implementation

Blind Audio Guidance System: Slide 16



Software Flowchart

Blind Audio Guidance System: Slide 17



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Testing Code

Testing Code for RFID Input

```
//**********************************************
//*********( RFID INPUT INTERRUPT )**********
//**********************************************
INTERRUPT(_SER_)SIN()
{

static char a;
a='/0';

    if ((SCON & 0x01 == 0x01))
    {
        a=SBUF;
        SCON=SCON^0x01;
        SBUF=a;
        SCON=SCON^0x02;
    }

}

//**************************************
//*********( MAIN FUNCTION )**********
//**************************************

void main()
{
    IE = 0x90;            // enable Serial interrupts
    SCON = 0x50;          // mode 1, 8-bit uart, enable receiver
    TMOD = 0x20;          // timer 1, mode 2, 8-bit reload
    TH1  = 0xE8;          // set the timer for 2400 baud
    setbit(TCON.6);       // start the timer
}
```

Actual Code for RFID Input

```
INTERRUPT(_SER_)SIN()
{

static char a;
a='/0';

    if ((SCON & 0x01 == 0x01))
    {

        a=SBUF; //retrieve the byte from the recieve buffer
        RFID[i]=a; //saved the byte into the RFID tag array
        clrbit(SCON.0); //clear the RI flag to allow next byte to be recieved
        i++; //increment the RFID array index

        if(i==12)//check to see if the 12 byte tag has been filled
        {
            setbit(P3.5); //disable the rfid reader
            IE=0x00;// disable the interrupt
            clrbit(TCON.6); //stop the timer
            i=12;   //make sure i is 12 for the checking function
            delay(500); //give time for the rfid reader to be disabled
        }
    }

}
```

Testing Code

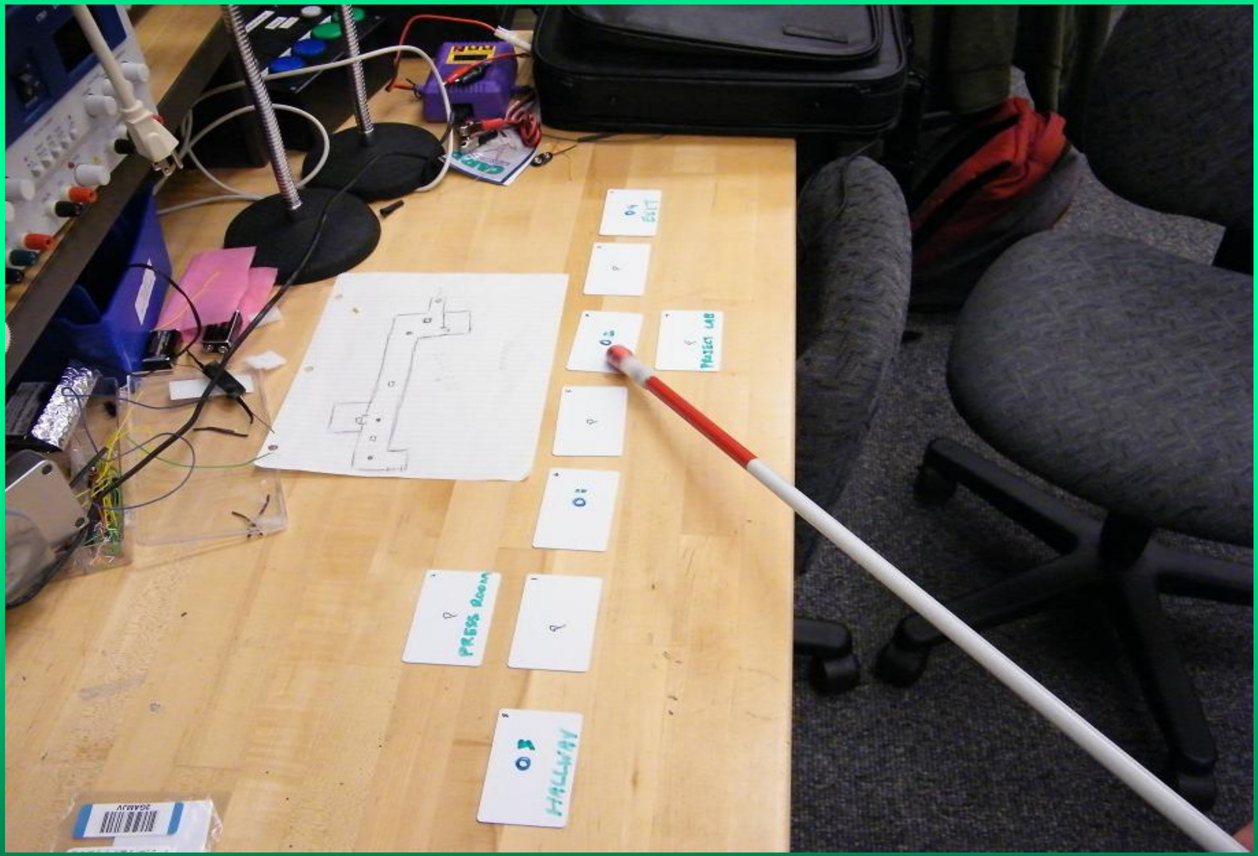
Testing Code for Text-to-Speech Output

```
//******************************************************
//*********( TEXT-TO-SPEECH OUTPUT FUNCTION )**********
//******************************************************

void SEROUT(int whichTAG)
{

    serinit(1200);
    printf("volume=7;");
    delay(5000);

    switch(whichTAG)    //Output the proper speech based on the RFID tag that was read
    {
        case 1:
            printf("say=continue walking forward;");
            delay(5000);
            break;
        case 2:
            printf("say=turn right and continue walking;");
            delay(5000);
            break;
        case 3:
            printf("say=turn left and continue walking;");
            delay(5000);
            break;
        case 4:
            printf("say=turn around and walk back;");
            delay(5000);
            break;
    }
}
```

Testing Code Speech Recognition Input

```
//******************************************************
//*********( SPEECH RECOGNITION FUNCTION )**********
//******************************************************

void SPEECHREC()
{
    serinit(9600);

    P2=0xFF;

    do
    {
        //check the value of P2 and output the spoken word
        switch(P2)
        {
            case 0x01:
                printf("Restroom");
                break;
            case 0x02:
                printf("Elevator");
                break;
            case 0x03:
                printf("Labroom");
                break;
            case 0x55:
                printf("speech too long");
                break;
            case 0x66:
                printf("speech too short");
                break;
            case 0x77:
                printf("speech unrecognized");
                break;
        }
    }
    while(1==1);

}
```

Testing Procedure



Design Constraints

- Must be portable (size and power)
- Affordable for most users and businesses
- Cost must be kept down to a minimum while maintaining full functionality
- Programming as well as hardware must be kept as simple as possible due to time constraints
- Previous location tags should not be within read range of direction output tags
- Tags will be placed on the floor, and the reader must be within range

Marketing and Social Impact

- As mentioned previously with 21.2 million visually impaired people in the United States alone, it would be smart for businesses to cater to their needs.

- The use of RFID technology can help to do this at a lower cost than most other technologies on the market today.

- This system would give the visually impaired an opportunity to integrate with society more easily.

- These people would have a greater sense of independence.

Cost

Blind Audio Guidance System: Slide 23

Cost Analysis

Table 1: Component Cost

PARTS	DESCRIPTION	Quantity	ESTIMATED COST
MINI-MAX/51-C2*	Microcontroller	1	$70.00
Parallax EMIC TTS**	Text to Speech Module	1	**$80.00
Parallax 125MHz RFID Module**	RFID Tag Reader	1	**$40.00
HM2007 Speech Recognition Kit**	Speech Recognition Kit	1	$179.00
Parallax 12MHz Transponder	RFID Tag	100	$62.00
Audio Control Module	2.5mm jack	1	$5.00
Miscellaneous	Miscellaneous	---	$30.00
10,000mah NiMH Battery**	6v Rechargeable battery	1	**$51.50
MRC Super Brain 960**	AC/DC Delta Peak Charger	1	**$58.00
Total Donations	------------	---	-$229.50
TOTAL			$346.00

* PARTS AQUIRED

** PARTS DONATED

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Questions