SMART FLAT

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ABSTRACT: The objective is to build a smart flat through which the infrastructure supporting the physically challenged helps by recognizing the human voice and their presence thereby activating the electrical appliances at home. The designed system is a better way of accessing the infrastructure and the Speech operated system for home appliance, it is a software designed using both MATLAB and EMBEDDED C.

Keywords: Smart flat, Matlab, Embedded C.

Introduction :

The main parts in the software system is voice train process and voice recognition process for the MATLAB based voice recognition and recognition of human presense through Embedded C programming. Main objectives of the project is design a graphical user interface (GUI) and source code that can recognize the human voice, as well their presence. When it comes to the voice recognition any user who had trained their voice into the system can use the system. This is because, system built to recognize user's speech without the necessity of user's identity. System user can record their voice by using microphone. After recording, system processes the voice, stores it, and compares it with the memory. If the voice matches, then the system sends the data to hardware that has been connected to home appliances through serial port.

In the case of detection of Human presence, PIR SENSOR is used which on detection of Infra red radiation from the human body sends the signal to the programmed Micro controller. These signals are executed and the signal to switch on the power supply is sent. The appliances connected to the controller operate based on the outputs of the controller. The entire system can be made dynamic by including a temperature sensor which automatically maintains the room temperature. Using a clock pulse generator with the controller, it is prone to dynamically coordinate with the inputs and process accordingly.

The main parts of the hardware building system is, Accessibility to community services and facilities is the first factor to consider in site selection and selecting residential sites in general should apply.(This criteria covers economy, topography, subsoil conditions, and existing utility services. Sites subject to traffic hazards, excessive noise, or polluted air should be avoided.)

Project Details:

Problem overview

Many systems today have used remote control to activate certain home appliances, the appliances such as air conditioner, television, radio ,and soon. This method is difficult to a person who can't move or paralyzed. So, because of this type of problem, the systems that use voice as an input or directive designed. More speech recognitionsystem now used isolated recognition method to recognize human's voice. This isolated method can only recognize one word at a time. There is a time limit to recognize user's voice. The improvement for the isolated method is continuous method; user can give a longer voice command to activate appliances. Building up a furniture system that is totally accessible to the challenged. The common height of the normal furniture must vary when compared to the people with disabilities. Cutting the costs and bringing it to the people in an economical way is primary motto of this project. The existing and proposed approaches to the sites (street improvement, widening; surface; sidewalks) and public utilities should be considered. Ease of Access is the main criteria and it is to be noted that all the building entrances should have a proper access that will help the challenged.

History behind:

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While AT&T bell laboratories developed a primitive device that could recognize speech in the 1940's, researchers knew that the widespread use of speech recognition would depend on the ability to accurately and consistently perceive subtle and complex verbal input. Thus, in the 1960's, researchers turned their focus towards a series of smaller goals that would aid in developing the larger speech recognition system. As a first step, developers created a device that would use discrete speech, verbal stimuli punctuated by smaller pauses. However, in the 1970's, continuous speech recognition, which does not require the user to pause between words, begun.

Speech operated systems were first used by severely disabled individuals with normal speech. The goal was to promote independence whereby speech recognition was used to convert human speech signals into effective actions. The first voice activated wheelchair with an environmental control unit (ECU) was developed in the late 1970's at rehabilitation medicine in different countries . The user could operate multiple items including the telephone, radio, fans, curtains, intercom, page-turner and more.

Though there exists a similar system it is not cost effective and affordable by the middle class families who intend to provide a comfortable living .for the challenged.

Our new SMART FLAT:

The idea of Smart Flat is to incorporate better ways of operating home appliances and infrastructure. The idea takes shape for its immense scope of implementation in most parts of living spaces and its ease of operation bolsters its reliability Our country is a developing nation and is looking forward for simple and cost effective methodologies in the areas of appliances and infrastructure The design of the project from start till end will follow simple ways of construct ion and implementation with the facilities available. There are 4 phases of methodology to be followed in order to achieve the objective of the project. The first phase is project design; the second phase is GUI (graphical user interface) and also the layout view of plan (using CAD, MATLAB and Embedded C software), third phase is design the GUI and final phase of real time testing methodology of the complete system.

- Project completion
- GUI and design layout
- Design source code
- Testing methodology

Demo speech recognition by MATLAB is as follows

RECORDING VOICE IN MATLAB

There are several ways to record a human's voice into MATLAB. The simple way among them is:y = wavrecord() the voice is recorded in wave format.

Example to record voice in 5 seconds at 11.025 kHz sample rate: Fs = 11025; y = wavrecord(5*Fs,Fs)

PLAY THE RECORDED VOICE

To play the recorded voice, the voice must be recorded first. Source code to lat recorded voice is as below:

Fs = 11025;

y = wavrecord(5*Fs,Fs) wavpaly(y,Fs);
In order to plot we use plot(y) to show that the program is plotted. TO SAVE

THE RECORDE VOICE

To save the recorded voice, programmer must create one new folder on the same directory of m-file. Without this folder, voice in wave format cannot be saved.

traindir = 'train\';

filename = sprintf('%s%s.wav',trandir,appliancename); wavwrite(y,Fs,filename);

DWELLING STRUCTURES OF THE FLAT using CAD

Access:

All the building entrances which are being used by tenants should be approached by paved walks, with non-skid surface, sloped for drainage. The proposed inclination is not over 1 in 20 (or 5 percent) . Use of steps should be forfeited for a better access.

Landing platforms at all building entrance doors should be levelled , sloped only as required for drainage. The platform width should be at least 1 ft beyond the door jambs. Platforms should be at least 3 ft deep if doors swing in, and 5 ft deep if doors swing out, but never less than 3 ft beyond the edge of the fully open door .

Ramps:

Most wheelchair users can negotiate a ramp sloped 5 percent or less without assistance. Steeper ramps limit independent chair use and should never be used . They are hazardous not only to wheelchair users but also to persons with artificial limbs and to the elderly. Ramp surfaces should be fireproof and nonslip

Elevators:

It should not be necessary to go through the lobby to reach an ambulance. If there is no lower-level entrance, the approach should be through a rear or side door in the elevator, thence to the service entrance to the ambulance. Handrails and anchors should support 250 Ib for 5 min; they should extend at least 12 in . (24". is preferable)

Entrances:

Entrance doors to multifamily structures, community centres, and other public-use space should provide a clear minimum width passage of 3 ft. Entrance doors to individual dwellings should provide a clear minimum width passage of 2 ft-10 in. Thresholds that project above the floor should be avoided wherever possible. If a projection is unavoidable, it should be no higher than Y, in., featheredged to the floor, and 5 to 6 ft in. width.

Embedded C program for the detection of Human presence and Temperature control

The program code which is dumped in the microcontroller of the project is shown below.

```
#include <16F877A.h>  //Microcontroller Used
#include <lm35.c>  //Microcontroller Used
#use        delay  (clock=20000000) //20MHz Crystal Oscillator  void
main()
{
   int i = 0;
   unsigned long fanduty;  unsigned
   long ldr;
   int flag = 0;

   output_high(PIN_D2);
   output_high(PIN_D3);
   delay_ms(700);
  output_low(PIN_D2);
   output_low(PIN_D3);
   delay_ms(700);
```

```
  output_high(PIN_D3);
  output_high(PIN_D2);
  delay_ms(700);
  output_low(PIN_D2);
  output_low(PIN_D3);

  output_high(PIN_C0);
  output_low(PIN_D1);

while(1)
{
    temp_read = temp();

    set_adc_channel(2);   //
    delay_us(200);
    ldr = Read_ADC();

    if(input(PIN_B0))
    {
      if(temp_read >= 40)
      {
        if(fanduty <= 700)
        {
          fanduty = fanduty+100;
          set_pwm1_fanduty(duty);
          set_pwm2_fanduty(duty);
          output_high(PIN_D2);
        }
      }

      else
      {
        fanduty = 150;
        set_pwm1_fanduty(fanduty);
        set_pwm2_fanduty(fanduty);
```

```
        output_low(PIN_D2);
      }

      if(ldr >= 140)
      {

          output_high(PIN_D7);
          output_high(PIN_D3);
      }

      else
      {
        output_low(PIN_D7);
        output_low(PIN_D3);
      }

    }
    else
    {
      output_low(PIN_D7);
      output_low(PIN_D4);
      set_pwm1_fanduty(0);
      set_pwm2_fanduty(0);
    }
    delay_ms(160);

 }
}
```

Integrating the above MATLAB and EMBEDDED C programs in the Smart Flat and aiding with better design of infrastructure is known to prove promising results. The process of operation is easy to comprehend. First the voice recognition system identifies the voice of the person and connects the supply to the appliances Few changes in the mode of operation can be incorporated by directly interfacing the voice recognition to the appliances or enabling human presence detection using Embedded C as there are changes

that at times voices from out side the room are misinterpreted by the speech recognition. Once the human presence is detected with the help of a PIR sensor the micro controller switches on the electrical appliances needed including lights and fans. Temperature sensor for automatic speed control of fan is added for ease of living in the Smart Flat.

Merits of the project:

- This project helps in supporting to the challenged for a comfortable living.
- It helps to be in touch with the present standing technical trends in the room automation anD control.
- Economical pricing and making it economical to people.

PROJECT IMPLEMENTATION DETAILS:

Tasks	Activity	Required material	Time (hrs)	Skills required
Speech recognition	Creating a GUI	MATLAB and Embedded C	50hrs	Programming MATLAB
Furniture making	Making furniture for individual rooms	FURNITURE aterial (soft wood)	300hrs per room 4rooms then 300*4)	designing
Installing and Testing	Installing into the circuit boards and then appliances	Breadboards, connecting wires ,etc	10 hrs	Making circuitry connections

The approximate estimation time for the implementation is 1260hrs or 180 days in total.

Conclusion : The approximate estimation time for the implementation is 1260hrs or 180 days in total. The first phase is project design; the second phase is GUI (graphical user interface) and also the layout view of plan (using CAD, MATLAB and Embedded C software), third phase is design the GUI and final phase of real time testing methodology of the complete system.

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