Integration of Disabled People

INTRODUCTION

In the last years many systems have been designed to facilitate the integration of disabled people, particularly those with severe problems of movement, caused in many cases by brain paralysis.

The approaches that have been taken have supplied valid solutions but always at the cost of being based outside integrated, commercial and flexible systems.

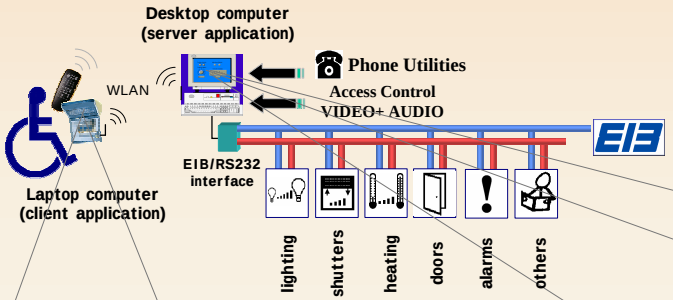
Our aim in this project has been the design and development of an intelligent home control system (control of the house environment), **accessible to people with different grades of disability** and to those who retain all their inherent functions; the called "**design for everyone**". To this end, a demonstration model of the system has been designed, which combines all the basic control functions, and which has permitted the development and debugging of the necessary software and hardware elements in our centre of investigation.

CONTROLLED FUNCTIONS

This system allows the integration of the functions that disabled users must have access to, these are on the whole common to any conventional intelligent home installation:

- **Environmental control**: An essential function in the integration of the disabled person. They must be allowed to control all the elements which they would normally never have access to because of their physical impediments: lighting, heating, shutters, and access to the home (motorised door and integrated audio visual systems).
- **Security and vigilance**: Alarm for the detection of intruders and safety alarms: gas, smoke detection etc.
- **Communication**: Access to the telephone in order to make personal and emergency calls to pre-programmed telephone numbers with pre-recorded messages.

Structure of the System



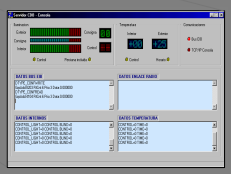
General Description

To access the typical components of the house (sensors, press buttons, etc) a **EIB bus** has been used, which supplies the main characteristic for the integration: the possibility of realising the control through a personal computer which will be used as a bridge by the disabled user.

By using **wireless local area network cards** (IEEE 802.11), and by client-server applications, the transmission of the audio visual signals and control commands is made possible. This solution increases considerably the flexibility of the system in its entirety and provides a high speed link (from 2 to 11 Mbps) and total mobility for the disabled person.

For the integration of the access control functions and of the telephonic communication functions, the desk top computer is equipped with a standard voice modem, sound card and a device to capture video.

Server Application



This application **exchanges data and commands with** the **mobile client (via TCP/IP)** and **the EIB bus of the installation (via RS-232)**. Performs:

- Control tasks in response to the clients requests, and data transmission (e.g. audio and video signals).
- **Processing of the audio and video signals** for the access control to the house, and th handling the **telephone calls**: hands free telephone, automatic dialling, transmission of pre-recorded messages, etc.

The application **runs on a background level**, in a transparent way for the user, who can execute other applications simultaneously. Therefore, the need for this computer **does not imply additional expense**, resulting in no increase in the cost of the project, because any available equipment in the house can be utilised (if any exists).

The **graphic interface** of the program is **purely informative** (just shows internal data useful during the installation of the system and debugging stages).

The **configuration and setting of parameters** of the installation are realised through inputs in the **Windows Registry** (in the same way as the client), which allows to make adaptations easily through an external application to any installation in a house.

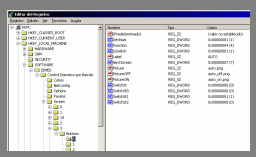
Client Application

The client (running in the laptop computer) is an **easy to use graphic interface** suitable for any kind of user whether able-bodied or disabled. As such, this interface **allows** the possibility of being run using **scan techniques**, a **conventional mouse** or a **touch screen**.

Its functional character covers a wide range of components installed in the different rooms of the house. These are accessible through suitable selections of the different options the program screen offers.

All the parameters of the program configuration are stored in the **Windows registry**, and include:

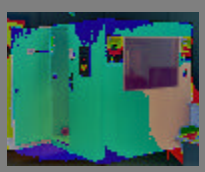
- Network configuration: TCP/IP socket for the communication with the server.
- Scan options: type and activation, scan period, etc...
- General parameters: kind of button, etc...
- Screens: hierarchical structure of the screens, buttons on each of them. For each button: text label, image (icon), next screen or the action realised (for example, turning the lights on.).



As an added advantage it is possible to have the **client and the server in the same computer**, conveniently configuring the TCP/IP socket in both applications. We could dispose of a "conventional " tool for the control and monitoring of the bus; the communication between both applications would happen through the internally established TCP/IP connection, making network cards unnecessary.

Remote access is also possible from any computer connected to the Internet, through communication with TCP/IP sockets.

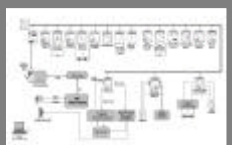
Demonstration Model



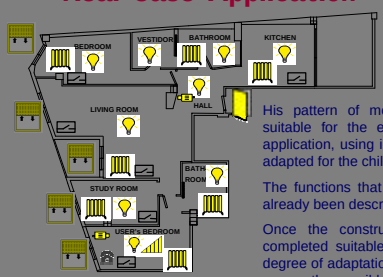
The system has been implemented in a portable **demonstration model**, which includes the functions of environmental control. The model is a conventional EIB installation to which the previously described elements have been added.

The basic aims of developing this demonstration model have been to: realise the design of the installation on a small scale, which allows us to fine-tune the system in our research centre, and to use it as an example of the working system to promote its installation in houses of disabled people.

The elements used are restricted to a single room but includes all the necessary devices needed for the control of the following functions (accessible from the client application in the laptop computer, and most of them manually as well).



Real Case Application



The system is being installed in the house of a six year old disabled user with a retardation of phycomotor development due to a chronic encephalopathy, caused by a perinatal cerebral hypoxia.

His pattern of movement makes the scanning techniques suitable for the easy access to the user interface of the application, using in this case a push button sensor especially adapted for the child.

The functions that will be included are the ones which have already been described in the demonstration model.

Once the construction and installation of the system is completed suitable studies will be undertaken to assess the degree of adaptation of the user to the system, studies will also assess the possible modifications and improvements that could be introduced in the future.