

Eye-Contact Communication in human vehicle

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Abstract - Aged people are increasing, and IT gap is also expanding. In order to solve the problem, we composed the intelligent space and eye contact communication. Intelligent space can pursue by getting a color from the camera

1. Introduction

Recently, in our country, the rapidness in aging is remarkable, but on the other hand, birth rate has been decreasing. Since some aged people cannot use information equipment validly, IT gap is expanding

A user's situation is judged based on the information from two or more information terminals, such as camera, GPS, etc. Man's need of returning information will be build by the intellectual wall type human centered architecture. We have verified the effectiveness of building risk indicating systems connected to the multi-platform display and human vehicle.

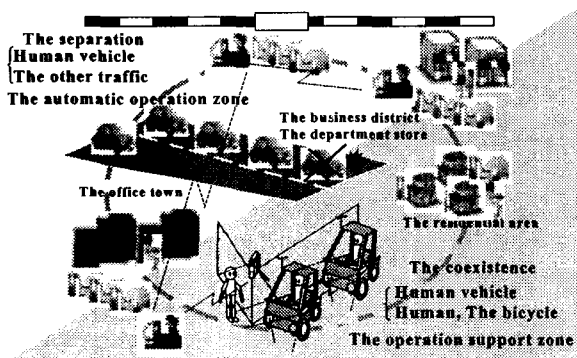


Fig 1. Human centered architecture

2. The multi - platform display and the experiment system

Since the ability of PDA and the plasma display monitoring is different, the most suitable way is using multi- platform display.

Using the handheld terminal such as notebook PC, the information sensor from the camera judges the situation. We build human centered architecture by indicating user's need on the platform

To build a system, we divided the living space, into 3 situations.

Inside the room: The human centered IT system to read Web.

Outside the room: The human centered IT system to call an

electric car, supported by GPS's position information.

Inside the car: Indicating risks by human centered IT system.

We built and evaluated a human centered network system to function with the above mentioned 3 situations.

These systems do not need any special soft ware. The HTML is controlled real-time by watching human's position. When this HTML system is established, users can receive the information easily.

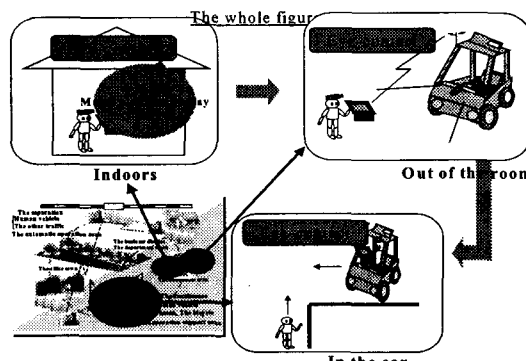


Fig 2. The whole figure

3. The indoor system

This is the human centered IT system to read from Web. This system get the face direction information of human by using the camera on the head and by plasma display monitor.

By this information, we can find out which part of the plasma display has been watched.

The detailed information of the human's attention will be indicated on the information terminal.^{1) 2)}

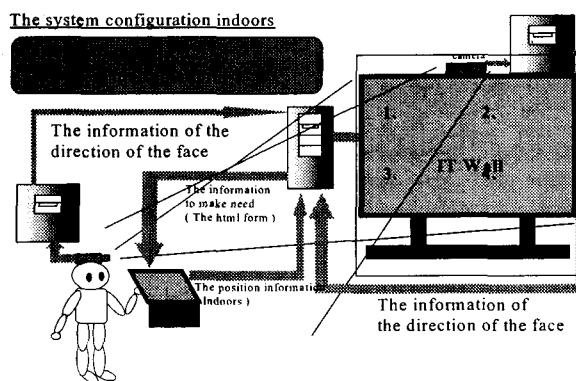


Fig 3. The indoor system



Fig.4 The indoor system experiment scenery

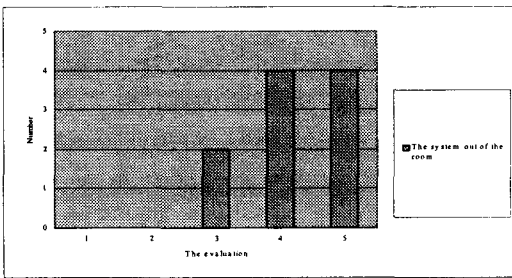
3.1 The experiment result and the evaluation

The experiment result and the evaluation of the in door system with 10 examinees, we evaluated the systems.

The result are shown as follows

1:0 , 2:1 , 3:4 , 4:4 , 5:1
the average:3.5

The effectiveness of the system could be shown.



Graph 1. The experiment result

4. The system out of the room

The human centered system by using the information terminal outside of the room to support human, until getting on an electric car. In the room, human information was received by using the camera, but out of the room, it is impossible to receive human's position information out of the camera's view area.

To overcome this situation, we receive human's information from GPS, by the electric car's camera. Appearing in the view of the camera, human beckons the electric car to come.

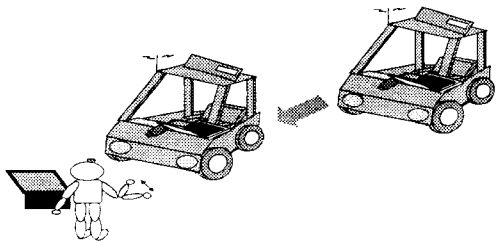


Fig 5. The system out of the room

4.1 GPS

GPS application is built up by Visual Basic. GPS data get from a serial port (COM port) as sequent characters. At Fig.6, GPS data is analyzed and displayed.

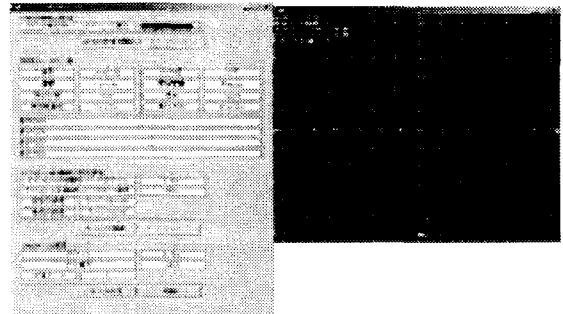


Fig6. GPS application



Fig 7. The system out of the room experiment scenery

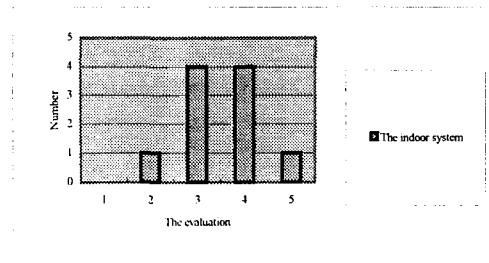
4.2 The experiment result and the evaluation

The experiment result and the evaluation of the in door system with 10 examinees, we evaluated the systems.

The result are shown as follows

1:0 , 2:0 , 3:2 , 4:4 , 5:4
the average:4.2

The effectiveness of the system could be shown.



Graph 2. The experiment result

5. The system in the car

After boarding on an electric car, and checked the risk indicating the information terminal will be switched to the

human centered architecture by to support the driver. We need to get the surrounding environment information for risk indicating system.

Receiving information by stereo view and all kinds of sensor from the camera system installed on the street, we experimented a simulation to indicate the most suitable warning signals if my dangerous.

Our experiment was done at the L shaped road. First, a people and an electric car toward the corner from the different direction. Position information of the people and the electric car will be received from the stereo view system installed at the corner. Moreover, we are able to receive the human face direction (eye-contact communication is established), speed and steering wheel information, from the cameras taken on the people's head and at inside of the car.

To get real-time function, the driver will receive warning at anytime. We could know where is people facing to.^{3) 4)}

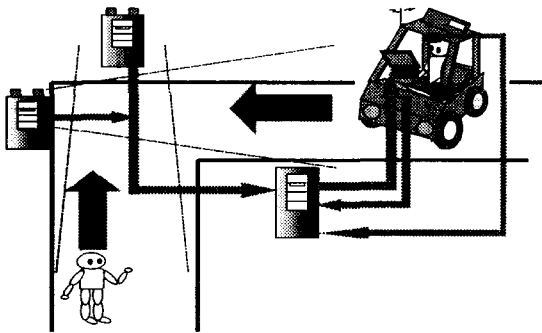
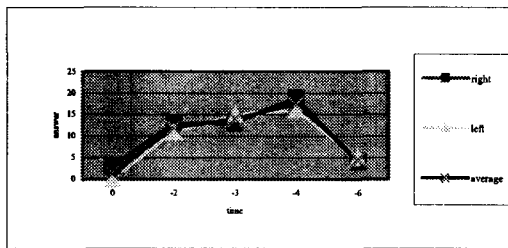


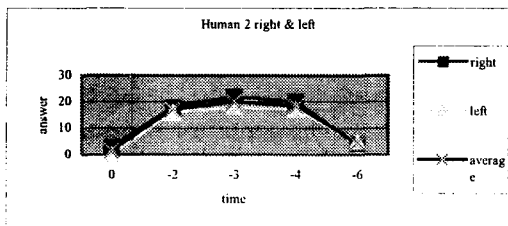
Fig 8. The system in the car

6. Simulation result

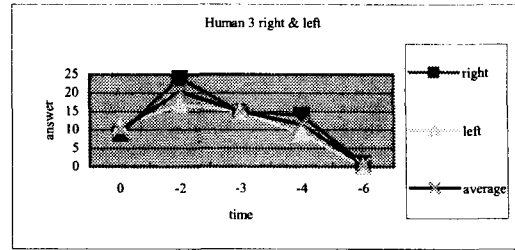
The simulation performed dangerous warning with the sound, 0, 2, 3, 4, and 6 seconds before the car went into the corner. The man has three start positions.^{5) 6) 7)}



Graph3. Human1 right & left



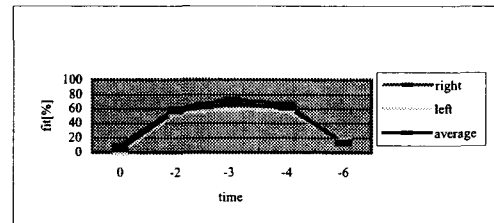
Graph4. Human2 right & left



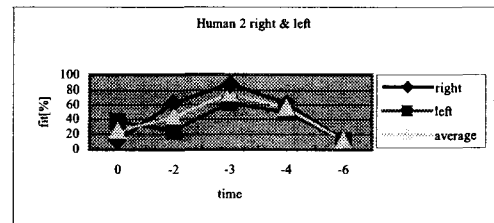
Graph5. Human3 right & left

7. Experiment result

We got a likely result between simulation and experiment. In the part of the simulation result and data are reversed. We consider that the surrounding information was not performed correctly. This is corrected by increasing samples. From the experiment result, dangerous warning is performed, 2 or 4 seconds before an electric car turned to the corner.



Graph6. Simulation result



Graph7. Experiment result

8. Dangerous warning experiment (the sound and the display)

Many people are worried about voice warning. Then, dangerous presentation performed by the display and the sound. A large screen shows the information on surrounding. A small display shows the nearly cross road information. This is the same multi platform display as an indoor system.

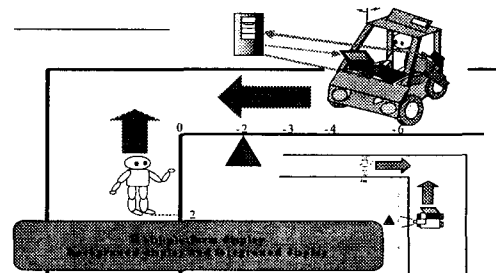


Fig9. Dangerous display experiment

9. A time multi platform

In cognitive science, when there is a strong dangerous display a driver's effective view becomes narrow. In this case, the driver is dangerous. Then, in this system, a driver knows weak danger beforehand. And it leaves a driver in background at the head. A driver does not narrow an effective view by changing a display. A driver can deal reaction quickly in really dangerous. This display is called time multi-platform. (It changes from a weak background display to a strong foreground display)⁸⁾

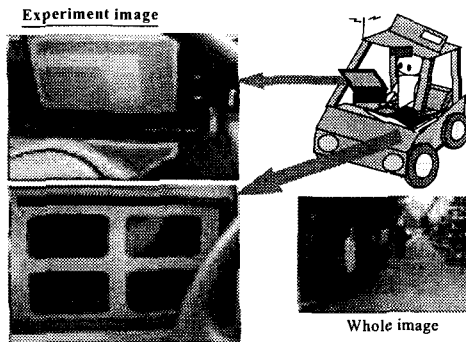


Fig10. Multi-platform dangerous warning

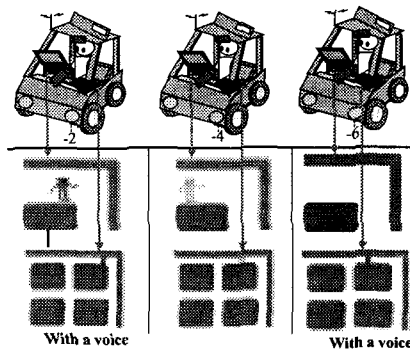


Fig11. Dangerous display experiment image

10. The experiment result and the evaluation

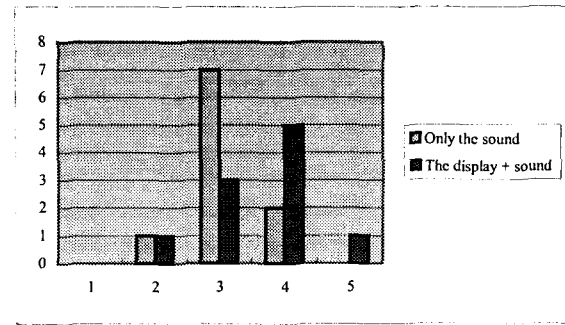
With 10 examinees, we evaluated the systems with inside the car.

The result are shown as follows. (Graph 1)

Only the sound : 1:0 , 2:1 , 3:7 , 4:2 , 5:0
The average only of the sound : 3.1

The display and the sound : 1:0 , 2:1 , 3:3 , 4:5 , 5:1
The average of the display and the sound : 3.6

The effectiveness of the system could be shown.



Graph3. Experiment result

Some people said that they were hard to drive with the display and the sound. However, he feels easy from the case of only a sound.

11. Conclusion

The network system of the human centered architecture using handheld terminal could be built. In the future, it will be necessary to make systems to increase the various supporting situation.

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