Brain Computer Interface

Feb 2009
HUG – ISR cooperation

Brain Computer Interface – Human navigation
Contextualization

HUG have EEG equipment and already performs several experiments with humans and with a 3D virtual reality simulator. Our objective is to give them a real robotic platform capable of receiving (through the internet) the same messages their simulator was receiving and, thus to perform the robot navigation. The final result is a robot remotely controlled by human brain.
HUG – ISR cooperation: Human navigation

Videos

Technical Solution – general diagram

**HUG – ISR cooperation: Human navigation – Technical Solution**

**Brain**

**EEG Module (Matlab)**

**HUG software**

**Pnet commands**

**Matlab Simulator**

**HUG**

Receives the commands/orders from the brain of the “human subject” and translate them to commands of movements \(\{F,B,L,R,S\}\) to be applied in the robot (in real time).

- \(F\) – front
- \(B\) – back
- \(L\) – left
- \(R\) – right
- \(S\) – stop

**ISR – Coimbra Mobile Robotics Laboratory**

**ISR – Pnet (C++)**

**IPC**

**Scout - module (Carmen)**

**Scout**

**Code that receives the messages from EEG(pnet commands)**.

**ISR**

Creates a code in C or C++ that receives the commands from **Pnet** and run them in the scout robot to make it move in real time.
HUG – ISR cooperation: Human navigation – Technical Solution

Technical Solution – description

Possible experiments

A – not knowing in advance the map where the robot could travel
B – knowing in advance the map where the robot could travel

Commands of movements:
F – front; B – back;
L – left; R – right; S – stop;

Receiving commands from HUG

EEG - Electroencephalogram

Receiving data from ISR

Internet – TCP/IP

Data & Time registration

Matlab - Simulator

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HUG – ISR cooperation: Human navigation – Technical Solution

Technical Solution – description

Robot: Scout

Collision Avoidance

Video registration

Data & Time registration

Internet – TCP/IP

Sending the data to HUG

Receiving data from HUG

Mobile Robotics Laboratory
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ISR – Coimbra
Future Work

- Studies on human-navigation by using Brain-Computer-Interface and Robots
- Robust human-machine interfaces based on BCI (Brain Computer Interface)
- Development of non-invasive devices for human-machine interface applicable to physically handicapped persons (paraplegic, physical disabilities)