

# The potential for eye-gaze technology in the assessment of awareness in minimally conscious state

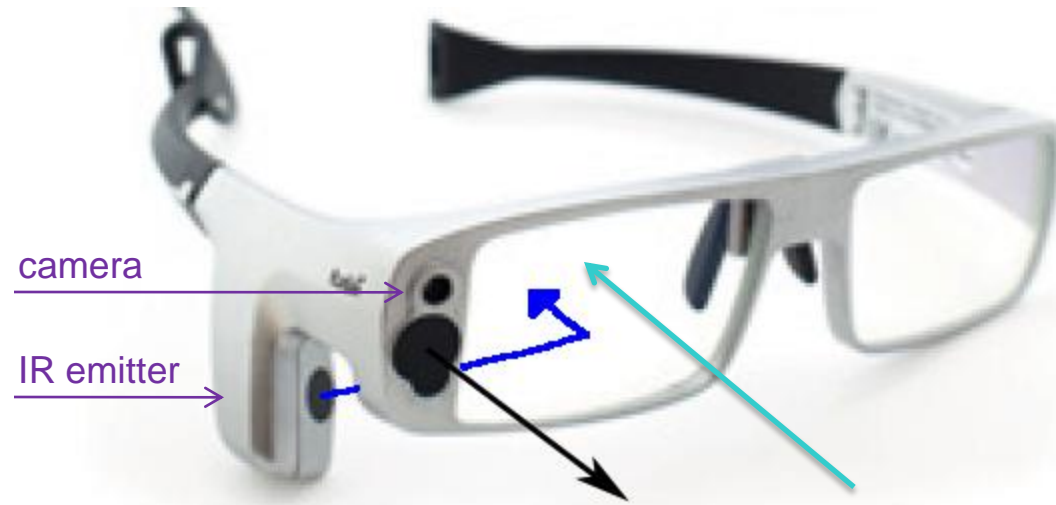
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- What are Tobii Glasses?
- Low Awareness States
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- Visual Perception Challenges
  - Exploring Assessment & Rehabilitation
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  - Future Research

# Tobii Glasses



# Tobii Glasses



- Technology similar, but much smaller & much closer to eye
- Key innovation is special glass which reflects IR light but lets visible light through

# Tobii Glasses

- Can be used in real life contexts!



# Tobii Glasses



- Market researchers aggregate data from many users

- But individual user's data can be analysed



## Low Awareness State

The body maintains essential physiological functions, such as breathing, and a sleep/wake pattern is demonstrated, but no evidence of awareness of their environment.

If prolonged = a permanent or persistent vegetative state

## Minimally Conscious State

Some discernable evidence of consciousness, even if it is inconsistent.

Identification of specific behaviours not found with people in low awareness or persistent vegetative state, such as following simple commands, purposeful behaviour, gestural or verbal Yes/No response.

## Exploring Assessment & Rehabilitation Opportunities

- Initial hope was to track specific eye movements of low awareness clients in various situations to assist with assessment:
  - During specific assessment activities
  - When alone
  - When in busy environment

## Exploring Assessment & Rehabilitation Opportunities

- Unable to calibrate low awareness clients
  - 9 successful calibration points needed
  - Always knew calibrating low awareness clients was unlikely
  - Plan all along was to use saved calibrations on clients

## Exploring Assessment & Rehabilitation Opportunities

- Staff testing using other people's calibration
  - Found calibration is more user dependent than other forms of eye gaze
  - Results not surprising considering that differences in facial geometry will have larger effects as camera is very close to eye
- Carried on anyway
  - Results inconclusive, as expected from staff trial

## What We Learned:

- Tobii Glasses in their current form are not likely to be a useful tool for assessing people in low awareness states
- Tobii Glasses in their current form only track the right eye
- Calibration is much more user dependent with this eye gaze technology than with previous

## Future Research

- A less accurate 2 or 3 point calibration may allow a small number of low awareness clients to be calibrated
- A left eye option would possibly allow access to people with a non-functional right eye

## Exploring Assessment & Rehabilitation Opportunities

- Several clients trailed the glasses in situations that challenged visual perception
  - Selecting from a set of static choices
  - Walking down a busy corridor
  - Learning to drive a powered wheelchair

## Exploring Assessment & Rehabilitation Opportunities

- Because these clients could follow commands, calibration was largely successful
- Data was collected about what clients attended to during situation of interest

## What We Learned:

- Having this data is only useful in a context of typical eye movement patterns. Since technology is new, there is no data set to compare against
- Marketing researchers are interested in aggregate data, not individual eye movements of a single person
- Sunlight floods the camera with infrared light and washes out the eye tracking data

## Future Research

- Pair up clients with persons who have no deficit or have learned the skill
  - Record uninjured person doing same static searching task and compare eye patterns
  - Record a skilled powered wheelchair user and compare eye patterns to new learner

## Future Research

- Huge potential for recording and giving feedback to clients and their therapists about visual perception tasks, such as
  - Where exactly is a client looking when searching for bowls in the kitchen
  - What bits of the traffic pattern did client look at just before and as s/he was crossing the road

## Future Research

- We are planning to use Tobii Glasses for another loan period soon

# Any Questions

