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Team Name: Glasses
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PG2

Wearable Medical Glasses

Deviation from PG1

The design requirements from PG1 have changed. At the very least, they have been renumbered. This document overrides and obviates PG1, and therefore, the Crxxx numbers from PG1 should not be used (they no longer match up to the requirements). Otherwise, PG2 builds upon, without modifying, PG1. The design intent remains, for the most part, unchanged.

Design Intent

With technological advancements in small, low-power computing, wearable medical devices are a hot research field, growing in popularity. In addition, we have seen wearable, wireless camera technology in the form of "glasses" ala projects such as Google Glass. Taking this trend, a multi-disciplinary research group comprised of professors and students from The University of Massachusetts, The University of Michigan and Yale University seek to build a research platform to investigate medical uses for such a wearable sensor device. The hypothesis is that by combining the camera sensing from the wearable glasses with other sensors, thereby creating a larger picture of the environment, non-invasive and non-medication interventions to mental illness will be possible.

Taking the hardware (and system) capabilities one step further from current systems, we'd like to build a very low power, light set of wireless glasses with an eye-facing camera to track dynamic eye features (movements, dilation, closures/blinks, gaze location/direction). Our proposed platform represents a starting point for this multi-disciplinary research team.

Design Requirements

Customer Requirement # (CRxxx)	**Mandatory / Optional**	**Description**
CR001	Mandatory	Build a set of wearable "glasses" to identify the dynamic features of the wearer's eye.
CR002	Mandatory	At minimum, the glasses device shall be capable of tracking eye movements at least as fast as the human eye can move.
CR003	Mandatory	It must be possible to retrieve data from the glasses either in real-time or after the fact from storage.
CR004	Mandatory	The device shall be light enough to be worm comfortably for some time.
CR005	Mandatory	If the glasses are equipped with a test or data acquisition harness, it shall not hinder the wearer's ability to wear the glasses comfortably in normal

		usage scenarios (e.g. driving, sitting).
CR006	Optional	The glasses shall be capable of tracking pupil dilation at a rate at least as fast as the eye can dilate and contract.
CR007	Optional	The glasses shall be capable of tracking eye closures and blinks.
CR008	Optional	The system shall be capable of determining the difference between an eye closure and a blink.
CR009	Optional	The system shall be capable of determining the gaze direction and associating it with the wearer's field of view (e.g. produce an image of the wearer's field of view with the gaze location marked).

Engineering Specifications

Engineering Requirement # (ERyyy)	**Mandatory / Optional**	**Description**
ER001	Mandatory	The glasses shall weigh below 0.5 kg.
ER002	Mandatory	The glasses shall have a balanced weight, so that they remain in place on a wearers face.
ER003	Mandatory	No part of the surface of the glasses shall exceed **D** degrees Celcius.
ER004	Mandatory	The glasses shall have an eye facing camera with minimum resolution **X1**.
ER005	Mandatory	The internal camera shall be capable of capturing and processing **X2** frames per second, which is fast enough to measure the movement of the eye.
ER006	Mandatory	The glasses will have a non-intrusive data acquisition interface for real-time data acquisition. This interface shall be capable of receiving a “full dump”, which is all of the information acquired by the sensors on the glasses.
ER007	Optional	The glasses shall have an eye facing camera with minimum resolution **Y1**, which is sufficient to track dilation and contraction of the pupils.
ER008	Optional	The internal camera shall be capable of capturing and processing **Y2** frames per second, which is fast enough to measure dilation and contraction of the pupils.
ER009	Optional	The glasses shall have an eye facing camera with minimum resolution **Z1**, which is sufficient to track blinking.
ER010	Optional	The internal camera shall be capable of capturing and processing **Z2** frames per second, which is fast enough to track blinking.