DEVELOPMENT OF A BIOINSPIRED POLARIZED SKYLIGHT BASED "NAVIGATION SENSE" FOR HUMANS

Abstract

We report on the concept development of a MEMS based navigation device to provide an insect -inspired "navigational sense" neurochip built in nanofabrication technology to disabled people. Desert ants navigate far away from their nest by analyzing the polarized skylight pattern. A bioinspired polarized skylight sensor was invented for mobile robot application [1-3]. For implementation in people small size is required. To be placed or implanted in the body, the device should be constructed using the biocompatible material such as Polydimethyloxane (PDMS).

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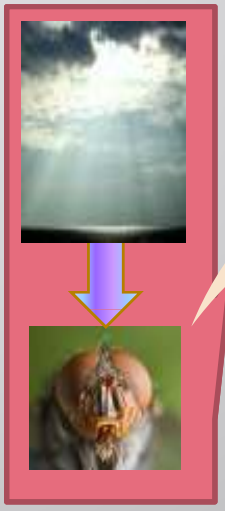
Principle



Application
Device Development
"Navigati...

Inspiration from nature

Bio-inspired Polarized light based navigation device

Global Navigation Satellite System (GNSS)

GNSS advantage
•most elaborate operation system for global positioning

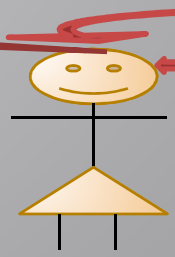
GNSS limitation
•low precision of the signal in certain condition such as in urban areas,
•intermittent coverage
•high cost maintenance
•risk to be shut down during times of conflict

Due to these risks there is need for systems that are GPS independent but possess the performance of GNSS

Concept development

	Existing device	New device
Size	Macrosize	Nanosize
Application	Mobile robot system	Navigational sense
Material	Materials used in electronics (silicon etc.)	Biocompatible materials (PDMS etc.)
	 © Chu et al. 2009	 Image © Brown Inst. for Brain Science

Placed on top of the human head



Interface & Communication

Novel MEMS PL-compass

Integration with external systems such as MEMS sensors, motors, GIS system and others

Input: Polarized light pattern

Polarized light detection: Nanopolarizer

Data acquisition: Nano processing system

Output: Integrates to the external devices

Outlook

- The implementation of the bioinspired polarized light navigation sensor for providing people with a "navigational sense" requires the connection between the devices and the human body.
- This "navigational sense" would be very beneficial to people at risk such as blind people, people bound to a wheelchair, people with Parkinson's disease and lost people including children.
- The miniaturization of the devices needs to be performed for successful connection to the human body.

References

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2. Chu J., Zhao. K., Wang T, Zhang Q.; Construction and performance test of a novel polarization sensor for navigation. *Sensors and Actuators, A: Physical* ***2008, 148, 75-82.***
3. Lambrinos, D.; Möller, R.; Labhart, T.; Pfeifer, R.; Wehner, R. A mobile robot employing insect strategies for navigation. *Robot. Auton. Syst.* ***2000, 30, 39-64.***