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Bioinspired navigation and water vapour detection realized with MEMS

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This paper proposes an alternative method of navigation and a technique for detection of water vapour near ground.

The navigation method is based on information contained in the natural polarisation pattern of the sky, and would be independent of satellite signals or the magnetic field. A small and energy efficient MEMS device would detect the polarization. This method is inspired by the natural navigation system of insects, such as honeybee (*Apis mellifera*). Honeybee eyes are well equipped for sky-linked navigation. The detection device consists of a light beam reactive MEMS, which is capable to detect the angle of a sunbeam. It could be embedded in sunglasses, with the necessary electrical power being provided by solar panels. Filtering the incoming sunlight reflections (e.g., reflection in the sea or at glaciers) is the most challenging issue in this approach; it is possible to be overcome by reducing the light spectrum to the ultraviolet range. By realizing this MEMS device with self-optimized function, a cheap and energy efficient way of navigation shall be obtained.

A water vapour detector would a very important device, especially at places where it is very hard to find water. The device should be able to detect the perfect spot to dig a well. In our current approach, the device is developed to detect near ground water vapour by utilizing the information of the infrared spectrum and the infrasound signals produced by the underground water. This mechanism is inspired by honeybees and elephants, which are able to detect water by using the senses of infrared spectrum sensitivity and infrasound signals sensitivity, respectively. Re-assembling existing infrared devices used for the temperature control and a computer model are developed into the device. The surrounding temperature field influences the detection of water vapour. By listing to the peaks of temperature differences in the viewed area, the water vapour can be indirectly detected. Underground rivers also can be traced by the infrasound signal output, using an array of sensitive microphones. The biggest problems in water vapour detection are cancelling sources such as plants or animals and inflicting temperature fluctuations in the scanned area. For the next step, this device could be upgraded to be more intelligent in detecting water vapour.

By realizing these proposed new methods of navigation and water vapour detection, intelligent and multi-functional tools for the human survival could be obtained.