

SGPS Project: Open Source Global Positioning System for individuals with reduced orientation and navigation abilities

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Abstract

Individuals who suffer from dementia sometimes lose track of where they are. Other cognitive disabilities can lead to reduced orientation and navigation abilities. One solution for such individuals is to use localizations technology such as GPS [1] so that these individual more easily can find their way back, or they can be located by their friends, colleagues and families. Problems with GPS include its high cost, computational expense and reliance on a complex satellite infrastructure. This project proposes an alternative to the widely used GPS-system that does not rely on the same infrastructure.

The Sunlight based Global Positioning System (SGPS) [2] is an open-source, institution-free systems which aims to come up with a device able to localize itself by using sunlight properties, such as light intensity, angle of incidence, or color (hue). This properties are chosen because they are very easy to measure and the sensors needed use to be very cheap.

Ideally, the focus of the SGPS project is to replace the well-known GPS, which is an institution-dependent system, requires a huge infrastructure to work properly, it consumes great amount of energy and it is also expensive. The GPS has other problems, such solar storms, which could disable the satellites at any moment (this is becoming a great problem nowadays). Since the SGPS project is still in its first steps, there are some issues that need to be addressed before considering it as a substitute of the GPS: its accuracy and refresh rate are the biggest drawback we face in our research.

The operating principle is very easy: a sensor measures sunlight properties (until now we focused on sunlight intensity) until the sunrise and sunset are detected. By applying a brief celestial model, the earth coordinates of that object can be found out with a relatively small error. One of the main advantages of this system is that if the celestial model is changed, it can be applied to localize objects in other planets, which solves a problem of global positioning outside the earth, where there are not enough satellites to create a GPS system.

Around the SGPS project, an open research community has been created [3] with the main objective of allowing everybody to contribute to this project. The open source philosophy (in both hardware and software) applied to the SGPS device is extended to achieve open source documentation reachable and modifiable by anyone. This way, not only associated researchers can contribute to the project, but anyone around the world can contribute or even publish about the SGPS project. This model has been successfully applied in many software and hardware projects, such as Arduino electronic platform [4] or even Linux OS [5].

References

1. B. Hofmann-Wellenhof, H. Lichtenegger and J. Collins. Global Positioning System: Theory and Practice 4th edition, Springer Verlag, Berlin, Germany, 1997.
2. J.V. Gómez, F.E. Sandnes and B. Fernández. *Sunlight Intensity Based Global Positioning System for Near-Surface Underwater Sensors*, Sensors, Vol. 12, No. 2, pp. 1930-1949, 2012.
3. SGPS Official Website: <http://www.sgpsproject.org>
4. Arduino Official Website: <http://www.arduino.cc>
5. The Linux Foundation Official Website: <http://www.linuxfoundation.org/>

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