

## Wireless Computer Mouse Powered with Harvested Energy

The computer mouse is a battery powered complex and most used PC peripheral. Since its invention in 1967, it changed a lot but up to now none can solely be powered with harvested energy while maintaining a good detection performance. This research is about powering a novel battery-less mouse with energy harvested from solar cells and/or thermoelectric generators

To start with, an analysis of the needed components was done in order to compare them. After that, a study on the statistical use of the mouse was conducted to find out how often they could be exposed to light or heat sources. Next to preliminary measurements, a concept was made and a prototype developed. As solar cells, devices with up to six times better performance than the competition were chosen. The specific power management and the embedded solar harvester designed achieve an efficiency of up to 82%. The thermoelectric generator block, that exploits the heat of the palm has good performances but yields only a small fraction of the energy collected by the solar source.

A new movement detection technique based on capacitive changes was studied. Currently it does not achieve the requirement of a mouse application but requires only  $12 \mu\text{W}$  at 500Hz and down to  $379 \text{ nW}$  at 10Hz. That makes this technology very helpful in extreme low power applications that require low sampling measurements.

The chosen movement detector consumes less than  $700 \mu\text{W}$  in run mode. That is 11 times less than the detector on a solar-powered mice presently on the market. It is also 2.2 times less than the Logitech M590 mouse.

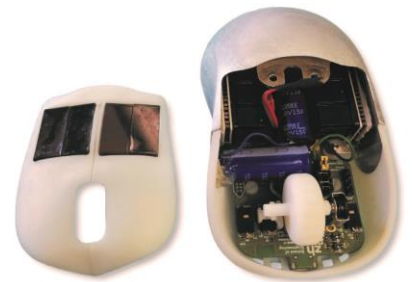
The prototype in a normal use condition needs a minimal light intensity of 312 lux to achieve operation without the need of external power. The average run/sleep power consumption is  $285 \mu\text{W}$  when used for normal office activity and down to  $16 \mu\text{W}$  in deep sleep mode thanks to a novel BLE SoC. The total daily energy consumption is reduced by approximately 22.6 times compared to GeneralKeys solar mouse and 3.8 times compared to the state of the art Logitech M590.

Thanks to the design and selection of the components for every single part of the device, the realized prototype sets a new milestone in wireless computer mouse power consumption. The novelty mouse runs solely on harvested energy from renewable sources in an environment while maintaining satisfactory performances (pointer refresh rate  $\sim 50\text{Hz}$ ) to guarantee normal working activity.

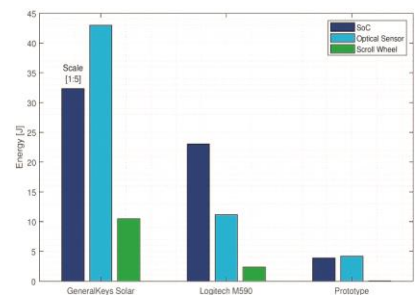


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Mouse prototype



Mice energy requirement