Azoteq

World Leader in Capacitive Proximity Sensing

Using proximity sensing to meet mobile device FCC SAR regulations

By Riaan du Toit

The use of wireless mobile devices has increased rapidly in the last few years, with high demands on wireless connection performance. The regulations for human exposure to electromagnetic radiation have become a limiting factor in the performance of wireless communication.

FCC SAR regulations dictate reduced output power levels in the presence of a human body. The effect of reduced power levels may lead to a connection interrupt, therefore the accurate detection of a human body is critical.

The limitations are explored through the use of specific examples where sensors are triggered falsely by non-human objects, hence limiting the output power of the device when that is not required. Capacitive sensing techniques are proposed to distinguish between human and non-human sensor activation.

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Articles

To enable next generation capacitive user interfaces and intelligent switch applications for users to interact naturally with products through capacitive proximity and touch

CAPPO Design (Metal Touch)

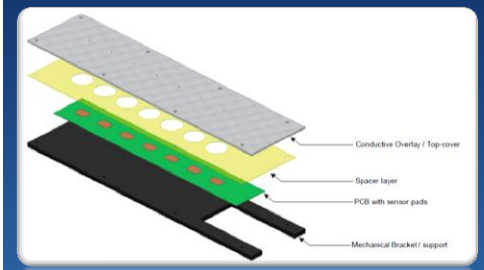
Traditional capacitive touch sensing has several advantages which include: reduced cost, no mechanical moving parts, low power, systems can be waterproofed without the need for additional mechanical considerations when adding buttons which leaves the product with a professional finish. There are, however, some limitations which can still be addressed by capacitive sensing, but in another form: CAPPO.

The advantages of CAPPO over traditional capacitive sensing are:

- Water does not affect the capacitive sensing. For traditional capacitive sensing, special design considerations have to be met for applications that can get water / other contaminants on the sensor.
- Users can wear gloves (even thick ones).
- Allows modern stainless steel or aluminum look.
- Higher RF immunity.
- Very robust since a small force is required for an actuation.
- Braille-friendly touch sensing.

Button Size

The buttons are recommended to have an area of at least 80 mm^2 (absolute minimum size)



Considerations for CAPPO Design Mechanics

Some considerations to keep in mind when designing CAPPO Hardware are:

1. Top Cover (thickness & material)
2. Spacer layer (thickness & material)
3. Adhesion of layers
4. Buttons (routing & spacing)
5. Size of the buttons (sensor pads) & holes in spacer layer

Logic 1 and AnaLectro Joins Azoteq's Expanding Representative Network

Logic 1 and AnaLectro have been appointed to represent Azoteq in Texas, Louisiana, Oklahoma, Arkansas, New York, New Jersey and Pennsylvania.

Azoteq is represented in all the major US markets, central Europe and has an extensive Asian coverage.

Azoteq's ProxSense® offers the most sensitive capacitive sensing solutions with the highest signal to noise ratio (>1000:1) in the market today. The high sensitivity enables proximity sensing up to 300mm and the ability to implement touch solutions that can work through 20mm cover materials.

"Azoteq partnered with Logic 1 and AnaLectro because they have excellent teams with vast experience and access to key customers", said Kobus Marneweck, Azoteq's VP of Marketing.

"Logic 1 is excited about our alliance with Azoteq. We believe there is a large untapped market for this technology, and we look forward to working with our key customers and Azoteq to bring leading edge proximity and touch solutions into real world consumer and industrial products" said David Lykes of Logic 1.

"AnaLectro is excited to be able to offer our customers Azoteq's unique capacitive sensing solutions. The ProxSense® product line will offer our customers a competitive advantage in the industries they serve," said Kevin Corcoran of AnaLectro.

About Logic 1:

As a Manufacturer's Representative, Logic 1 has over 30 years of technical sales experience supporting complex designs at major electronics based OEM's and Distribution accounts throughout Arkansas, Louisiana, Oklahoma and Texas.

About AnaLectro:

AnaLectro Technical Representatives represent state of the art sensor and instrumentation manufacturers providing Precision Measurement Solutions for Testing, Manufacturing and OEM applications.

AnaLectro has served the Mid-Atlantic Region for over 25 years providing their customers with innovative and cost effective solutions to the most demanding measurement applications.

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FCC Specific absorption rate regulations

The regulations imposed by the FCC (Federal Communications Commission) define a specific absorption rate (SAR), which is a safe measure of the rate at which RF signals are absorbed by the human body. Designers of wireless mobile devices tend to prefer higher output power levels for optimal performance of their product.

By adhering to the FCC SAR regulations, output power is reduced in cases where it is required, although also due to a variety of false triggers. Dropped connections and degraded upload performance are more likely to occur as a result of lowered wireless signal output power. The rejection of false triggers is a key aspect of optimizing the performance of a wireless connection.

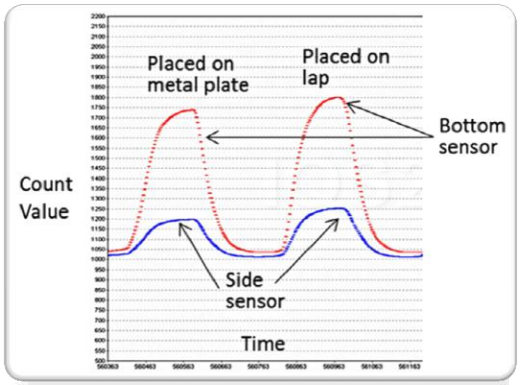
Solutions are required to distinguish between relevant activations and false activations. Offered in this article are techniques dependent on human behavior and human capability. Proposed is the use of multiple capacitive sensors with advanced adaptive characteristics, strategically placed in order to effectively solve the problem at hand.

Capacitive sensing

As opposed to IR solutions, capacitive sensing technology is preferred because of lower power consumption, the fact that an aperture is not essential and that it is not sensitive to ambient light conditions. Additional advantages include the small real estate required for the sensor and the low cost of such a solution.

Capacitive sensing can be done between a single electrode and the circuit common ground (self-capacitance), or between two electrodes (mutual capacitance). Each method has its advantages, but because of the largely variable parasitic capacitance between the circuit common ground and earth in mobile devices, mutual capacitance techniques are preferred.

The sensitivity of capacitive sensors is highly adjustable.



Distinguishing human vs.non-human objects

It is relatively simple to prove that it is impossible to distinguish between human and non-human triggers by observing capacitance in one dimension only.

The figure above shows an example where a sensor is placed on a human lap and then on an earthed metal sheet.

The difference in capacitive effect is much too small to distinguish, especially with the variance in proximity and human body characteristics.

To distinguish between human and metal plates, some possible solutions are:

- Use a multi-channel sensor instead of single channel sensor
- Use a Boolean condition that has to be true amongst all three channels to avoid a wrong trigger

Full Article can be found on EE Times Design here.

Updated GUIs for Azoteq's Evaluation Kits

Azoteq now has updated GUIs for most of the Evaluation Kits!

Please be sure to check to see that you have the latest software from Azoteq.

The GUI software can be downloaded at Azoteq's website. It is located at the Design Tab under Software & Tools.

Here is a list of the GUIs that have been updated:

IQS127, IQS128, IQS132/133/143,

IQS243, IQS253, IQS142, IQS259,

IQS121, IQS152, IQS158, IQS316

To stream data from the evaluation kits to the GUI, the use of the DS100 or CT200 is required.

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