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| Low power implementable pressure sensor interface for biomedical applications |
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Low power implementable pressure sensor interface for biomedical applications

Prof/Ahmed Hussein - Prof/Amr Hafez

**Abstract:**

One of the most thriving applications in the biomedical

field is a new genre of portable blood-pressure sensors that provide both functional efficiency and surgical ease. CMOS IC technology offers a compact low-cost, low-power integrated solution.

A MEMS sensor interface is used to convert strain due to applied pressure into capacitance variation. Capacitance to voltage transformation is then performed.

Further processing can be accomplished by converting the analog quantity to digital. Due to the nature of the application, low power and high resolution sigma-delta converters are preferred for the A/D conversion. Simple digital circuitry can be used to refine the seemingly-gibberish digital output into a usable signal. A complete

design also requires the exploration of some energy scavenging techniques (RF power harvesting via a wireless link in this case) for long term

operation to avoid battery replacement surgeries.

Implementation of almost the complete IC is done from system description to layout and simulations. Target technology is TSMC 0.130µm CMOS fabrication process. Mixed-signal design flow was adopted since the proposed design contains both digital and analog designs.

**FUTURE WORK:**

• Future work that complements this work includes:

• Back-scattering

Back-scattering is a low power modulation scheme in which the implanted

chip reflects a part of the incident RF wave back to the reader.

• Line coding for back-scattering

Back-scattering requires line coding before data transmission to achieve an acceptable error rate and guarantee a continuous power supply.

• Adaptive RF powering

In this project the receiving unit is implanted inside a freely moving body, thus resulting in a constantly changing coupling coefficient. Therefore, an RF powering system with an adaptive control capability is required.

• Fabrication to test the real performance on Silicon

The entire chip has been laid out making it possible to realize a prototype and test its functionality.

• Power harvesting board fabrication • Antenna and matching circuit design • Temperature compensation

Pressure measurement is affected by many factors from which temperature is the dominant. Temperature compensation can significantly improve the pressure measurement accuracy.

• On-chip clock generator

Accurate and stable clock generator is essential for switching circuits

operation. For a fully integrated design, the clock should be implemented on

chip.