Project Proposal

Project title
Software and Hardware Improvements for The Low-Power Microwave Breast Cancer Radar-Based Screening Prototype
Group Members
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Project Supervisor
Prof. Milica Popović Contact: 1. milica.popovich@mcgill.ca 2. Tel: 514 398 3417 3. Fax: 514 398 4470 Affiliation: ● McGill University ○ Faculty of Engineering ■ Department of Electrical and Computer Engineering ● Computational Electromagnetics Lab ○ RF Breast Cancer Detection Research Group
Intellectual Property
Not specified by the supervisor.
NDA
Not required by the supervisor.
Group meetings and meetings with advisor(s)
The research group have weekly meetings on Wednesday discussing work progress. We are expected to come to the upcoming one this week. More details will be settled thereafter.
Project requirements:
● Initial assessment of resources:

The RF Breast Cancer Detection Research Group, under the supervision of Prof. Milica Popović, is located on the 6th floor of the McConnell Engineering Building. Over the years, preliminary milestones towards a clinical prototype for microwave breast screening via multistatic radar using time-domain measurements has been achieved, including anatomically and electrically realistic breast models ("phantoms"), the results of clinical trials, and a model of wearable antenna imtregredted bra to facilitate the data collection system in a clinical setting.

- Resource access plan:
    - Quickly study the published journal articles of the research group to catch up with the team's current progress.
    - Work closely with the professor and her Master/ PhD students. Actively commit to the weekly meeting and work sessions.
    - Maintain close communication and coordination between team partners to ensure the required milestones can be achieved on time.

Project abstract (200 words):

- Overall Goal:
  Microwave breast cancer detection techniques have been proposed as a possible complementary technology to the standard methods of x-ray mammography (for screening), and ultrasound and magnetic resonance imaging (MRI) (for diagnosis). Microwave methods offer the potential advantages of low cost, comfortable scans, without the ionizing radiation that mammography uses. Microwave-based breast imaging systems operate based on the inherent contrast in the dielectric properties between healthy and malignant tissues over the given frequency range. The scope of this project is focused on the software & hardware improvements for the current prototype. This includes several aspects related to breast tissue and tumor imaging and detection, such as antenna and array design, signal & image processing algorithm, classification and machine learning techniques, etc.
- Motivation: As students in computer engineering, we both have an interest in doing research. Thus, applying our knowledge of hardware design, software engineering, and computer systems into an impactful area like medicine is a perfect match for us. Since it is crucial to detect and treat breast cancer for women at an early stage, we are honored that we could use our knowledge in such a meaningful project.
- Expected Outcomes:
    - Understand the current stage development of the antenna and hardware design in breast cancer detection.
    - Understand the current stage development of the signal analysis and computer vision aspect of the group progress.
    - Beware of the hurdles and places that required our work for improvement.
    - Improving the hardware and software design of the breast cancer Radar-Based screening prototype.