

NSF grant awarded to three professors

To develop an ECL sensor utilizing existing mobile technology

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Right to left: Hyun Kwon, Padma Uppala and Rodney Summerscales discuss their research which involves mobile devices being used as detectors for biosensors. (Photo by Darren Heslop, IMC staff photographer)

Hyun Kwon, chair of the Department of Engineering & Computer Science, Padma Tadi Uppala, professor of public health, nutrition and wellness, and Rodney Summerscales, assistant professor of computer science have been awarded a research grant by the National Science Foundation in the amount of \$249,198.

“Many mobile devices have built-in sensors—cameras that can serve as detectors for biosensors,” says Kwon, primary investigator on the project. “We are developing an ECL sensor utilizing existing mobile technology, transforming what was traditionally an expensive and bulky biosensor into a portable and affordable one.”

ECL sensors work when a small voltage is applied to an ECL chemical and the chemical emits lights in the visible spectrum. The small voltage can be provided by the mobile device itself and the emitted light can be captured by the cameras, the resulting images of which can be analyzed by a mobile app.

“Our goal is to make this new sensor platform equivalent not only in performance to that of existing high-end biosensors,” says Kwon, “but also more affordable and form many different biosensor needs.”

The ECL biosensor can be used for diagnosis of biomarkers of various diseases, including breast cancer.

“These sensors have significantly improved the sensitivity of detecting low molecular weight biomarkers present in early stages of cancer,” explains Uppala. “This is important because of the prevalence and mortality rates of the disease.”

Both undergraduate and graduate students will participate by conducting experiments, running simulations, analyzing data, programming mobile apps and designing and prototyping sensor hardware.

“Revolutionizing existing sensors with the latest mobile technology fascinates me,” Kwon says. “It’s the inevitable trend in biosensor instrumentation.”

Though there have been attempts to develop ECL sensors with cell phones in the past, they have been limited to demonstrating feasibility of detecting very high concentrations of reactants without having any specific target molecules.

“This means no innovation has been made to the level of detecting proteins at clinically relevant levels,” the team says in their proposal.

“I am very excited to see this research taking a multidisciplinary approach,” Uppala adds. “To improve the health of the public is very fulfilling and I appreciate this avenue to serve the public and make the world a better place.”

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