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Project: System for Image-Guided Cancer Surgery

Our client, Professor Thomas “Rock” Mackie is in need of an endoscopic camera that will be used during the surgical removal of cancerous tumor cells. Recent work in Jamey Weichert’s UW lab has provided two fluorescent phospholipid ether small molecules, CLR-1501 and CLR-1502. These compounds are fluorescent versions of CLR-1404, a current radiolabeled cancer drug under clinical trial. A typical cancer patient would be injected with CLR-1501 and CLR-1502 two or more days before surgery. These compounds build up in tumor cells allowing the surgeon to efficiently and wholly remove any cancerous material. The surgeon must be able to view these cells during their excision, to accomplish this they must be excited with a specific wavelengths of light so that they fluoresce. Our team will be creating an endoscopic camera with an LED assembly and self-cleaning mechanism to allow the surgeon to effectively view these cells.

The LED light assembly will sequentially emit light at 500 nm (excitation wavelength for CLR-1501), 772 nm (excitation wavelength for CLR-1502), and a visible white light. The switching of the LED assembly will be timed to the frame rate of the camera, allowing the camera to capture three different images every three frames, one at 520 nm (emission spectrum for CLR-1501), 790 nm (emission spectrum for CLR-1502), and the third capturing all visible light. These three frames will then be separated into three different live video feeds, with each feed having a frame rate one third that of the camera and displaying its corresponding light spectrum image. The images will be displayed on a hands free monitor system. The endoscopic camera must also be able to clean the camera lens well within the patient’s body. Finally the camera and its lighting/cleaning assembly must all fit through a two cm incision in the patient.

Equipment and funding will be provided to us by Thomas Mackie. Our team will also have access to the rapid prototyping equipment at MIR. Finally Jamey Weichert will supply fluorescent compounds and existing minimally invasive surgical cameras and lighting systems that are currently available.