**MISSION STATEMENT**

More than seventy million people worldwide suffer from epilepsy. One third of them cannot be cured by conventional medication or treatments. In the most drastic cases, surgeons remove the afflicted portions of the patient's brain, determined by analyzing the brain using electrodes and electroencephalogram (EEG) data. Electrodes are implanted into the brain for up to five or six days at a time to monitor brain activity. Since current EEG technology uses wires extending from the electrodes to collect data, the patient is trapped within the radius of the EEG recording machine, with little to no mobility and convenience. Our objective is to create a secure, low power, wireless embedded solution to the aforementioned problem, allowing patients the freedom and mobility to return to their normal lives while enabling doctors to obtain the necessary neural information required to treat their patients’ conditions. In other words, after the device has been implanted, the patient should be able to go home, or at least run errands, without being constrained to their bed or place of rest in the hospital.

There are a number of problems and challenges associated with the project. The medical device must conform to several safety regulations. In particular, the device cannot change skin temperature by more than a few degrees Celsius, and it cannot deposit excess charge or current into the brain. To meet these requirements, we must reduce power consumption and add an additional component to the system to counter feedback power into the brain. Additionally, the device must provide accurate and real-time data, have a battery life of at least one day, and fit into a small area of 5x5 mm (similar to cross-section area of an electrode) and allow for users to move freely with the electrodes implanted in their head. The challenge is to use the smallest components and solutions to collect and transmit reliable and comprehensive data in the most power-efficient method. When the size of a component decreases, the amount of power it consumes remains constant. However as batteries decrease in size, the amount of power it can supply decreases, which is the primary limiting factor of the final product. By overcoming these challenges, we can deliver a competitive wireless solution for recording neural brain activity.

Since we only have two semesters to begin and finish this product, rapid prototyping iterations are necessary for developing a working outcome. Following are tentative dates for cycle releases of our prototypes and product.

* **Oct 21th, 2015**: proof-of-concept of real-time wireless transmission using one electrode and wireless control unit
* **Jan 25th, 2015**: expand the proof-of-concept to include multiple electrodes and wireless control units transmitting in real-time
* **Mar 27th, 2015**: final marketable product that conforms to government regulation

In summary, our device will achieve wireless neural data transmission and overcome many deficiencies and pitfalls in current products, such as mobility and convenience issues. We hope we can successfully deliver this mission and help untether millions of patients suffering brain ailments in the world.

Dear Dr. Tandon,

We are the Wireless Neural Recorder (WNR) project team, currently working on a wireless intracranial EEG data recording technology. The project seeks to develop a new electrode for intracranial EEG applications which utilize power-efficient wireless data transmission technology. By using wireless data transmission, we can significantly improve comfort and convenience of the status quo of current implanted EEG electrodes.

Currently, the graduate student Hamed Rahmani, is working on the implanted part of the electrode, which makes contact with brain tissue and is the entryway for electric neural data into the system. The undergraduate team will be working on digitizing the signals gathered by the implanted contact points and sending the resulting digital signal wirelessly to a terminal, where the data can be observed and analyzed.

Here is a list of the team members and mentors and their contact information:

1. Dr. Aydin Babakhani - mentor, aydin.babakhani@rice.edu

2. Dr. Gary Woods - mentor, glw1@rice.edu

3. Stephen Xia - team member, sx7@rice.edu

4. Tingkai Liu - team member, tl25@rice.edu

5. Yuan Gao - team member, yg18@rice.edu

6. Xin Huang - team member, xyh1 @rice.edu

7. Hamed Rahmani - graduate student mentor, hr11@rice.edu

We are very excited to have you on board as we are sure to benefit greatly from your medical expertise and profound experience with epilepsy and neural recording technology.

Thank you!

Regards,

WNR