

# Multi-Sensory System For Monitoring Diskinesias in Movement Disorders

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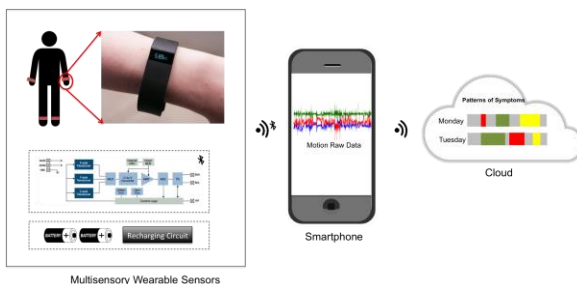
**Abstract— The Multi-Sensory Wearable Sensor System is a new and innovative way to monitor movement disorders. Wearable devices have various applications in which this system can be used in a real clinical setting. Wearable devices look to be one of the leading up and coming technologies in the biomedical device field.**

## I. INTRODUCTION

The new and upcoming technologies of wearable devices have many different applications. Most popularly, wearable devices are seen and used daily by millions of people worldwide as wristbands, headsets, and even “smart clothes”. While the technology is amazing, if used correctly in a medical setting, it can be used to diagnose different movement disorders. The wearable devices have different sensors that can track anything from movement, to position or orientation. This can help monitor a subject’s movements and be used to diagnose issues ranging from dementia, Attention Deficit Hyperactivity Disorder, or Parkinson’s disease.

## II. METHODS

Using sensors that can easily be attached to a person’s wrists and ankles, we will monitor Diskinesias in Movement Disorders. This will be accomplished through the use of accelerometers and gyroscopes amongst other hardware which will allow for wireless transmission of data. After collecting this data, it will be sent to a smartphone, computed and then forwarded to a cloud server. Once the data is uploaded to the server it will be displayed in easy-to-read charts, which will be less overwhelming than raw data, that can be analyzed by a physician to help predict changes in behavior and help administer medication.



## III. MANAGEMENT

As the manager of the team, Tom will be in charge of managing the flow and direction of the project. Distribution of jobs is being planned with Dan as Software, Trevor as Hardware with some server GUI software, and Tom also with Hardware and Signal Processing. However, each group

member will play a vital role in each step of the process.

## IV. STANDARDS

The multi-sensory system for monitoring dyskinesia is a non-invasive device meant to have no real risk wearing it. Although we do not expect there to be any risks with the system, we believe the FDA would classify it in Class II. This is due to the fact that it is a powered device, although the device will never exceed more than 5 Volts. While designing our device, we will work according to the medical device standards, especially IEC 60601-1, in order to prevent shock and burns while using electrical equipment. We will also follow IPC standards while designing our printed circuit boards.

## V. RESULTS

The aim of our multi-sensory system is to aid physicians in diagnosing and monitoring patients with movement disorders. Symptoms such as tremors or high intensity movements for long periods of time could be indications to different diseases. If physicians and clinical specialists are able to learn more about how each patient’s movement disorder affects their life, they can more accurately prescribe medications and therapy to each individual case. In a traditional physician-patient scenario, the physician can only see the patient’s symptoms for a short time during appointments in the office. During this short period of time, symptoms usually do not show, especially because the patient is not in their normal environment. With our proposed multi-sensory system, the physician will have access to the patient’s daily symptoms. With improved, lengthier, and more accurate monitoring, we can give patients with these disorders better lives and hopefully less dosage of medication.

## VI. DISCUSSION

Ideally a physician will be able to give this system to a patient to take home for a certain period of time. During this time, the patient will go about their normal lives while wearing the device twenty-four seven. During this time, the device will record their every movement (or during the set period of time that is distinguished). The data will be computed so that the physician will never see the raw data and thus making it easier for the physician to read and analyze. After the data computation, the physician will be able to monitor the patient’s data continuously. Once the physician feels they have collected enough data, the patient will return the system and be placed on a better treatment regimen that will hopefully give them a better quality of life.

[1] Dr. Kunal Mankodiya, University of Rhode Island

[2] 5 Things Preventing Technology Adoption in Health Care, Dr. Robert Pearl