

## Proposal

To create a system combining motion recognition and body position detection to determine the pain level of a patient and where the pain is likely to be located.

## Method

The Kinect system will allow us to track a user's position and gestures with a high degree of accuracy. This information will be used along with information about various common conditions to assess a pain rating. Each condition will be associated with the position of various body parts, as well as the time that the user has been in that position and how quickly they achieved the position. From this, we estimate the pain level in the user, and which body part the pain is located in. This information will be sent via TCP packet to a visualization application, which can be then viewed by a doctor or caretaker.

## Interface

The interface used is the Kinect system. The user ideally requires no special tools, as the system is designed to be passive. In fact, the user is not even required to be aware of the system for it to function, as the gestures that signal medical conditions are the natural human reactions to various emergency conditions.

## Programming

The bulk of the programming will be accomplished in the detectPain function. This function is called every frame in which a user is being actively tracked. A series of manually programmed conditions are checked, and condition is determined via relative positions of tracked body parts. For example, if both hands have rapidly moved to the same region as the neck, this may indicate choking. This is not only a painful condition but also a medical emergency. Severity of the condition is determined based on how quickly the user reacted, how long they remain in the position, and how much movement occurs (greater movement generally indicates more severe pain). In the future, this could be replaced with a database of possible conditions and their associated positions.

As of now, we have successfully utilized the Kinect system with the OpenNI API to track the neck of a user. Our current goal is to enable the tracking of other body parts, then to fill in the positions associated with conditions so that we can detect said conditions and their severity.