

# Recognizing User State from Haptic Data

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## Research Goal

Train a classifier to recognize negative user affect from pressure data from the TouchPad

- Develop acquisition techniques for pressure data from the TouchPad
- Observe and log patterns of positional and pressure data under frustrating conditions
- Derive a model of positional and pattern differences which are predictive of negative user affective state
- Develop an adaptive user interface which adjusts task difficulty level and user support

## Role in IMSC

Development of the application is a part of IMSC Communication Vision's system level project

- Examine the problem of multimodal sensing and fusion of data streams from speech, haptics, and vision during acquisition of complex skills
- Find optimal ways of combining raw sensory input to do user state sensing

## Research Approach

The TouchPad experiment asks the subject to assemble LEGO pieces following a set of pictures provided.

- Baseline TouchPad pressure and positional data for a normative record of the user's patterns
- Frustration data by providing the subject with a deficient set of instructions for the task
- Evaluation of the pleasantness and ease of completing the task



## Accomplishments

Data Analysis:

- Subjects evaluated the baseline task interface significantly more positively than that of the frustration task in terms of usability
- PCA is applied to pressure/positional data considered as time series to determine importance weight of each attribute in the series
- Fourier Transform is used to analyze frequencies in the time series
- Support Vector Machine is used to distinguish between baseline and frustration data samples.

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## Uniqueness & Related Work

### Uniqueness

- A larger sample of data points and subjects
- Build frustration into the design and follow up with a post-task validation of the experimental manipulation

### Related Work

- Mentis & Gay study (2002): Leaves frustration as an uncontrolled variable
- Qi et al. (2001): Assumes that emotional arousal is isomorphic with task difficulty

## 5-Year Plan

- Recruit 60 subjects for and carry out the main study
- Evaluate the success of Support Vector Machine approach in producing a classifier
- Integrate the haptic classifier into the Communication Vision experiment
- Evaluate the effectiveness of the haptic classifier as part of multimodal user state sensing