

Project Ideas

CS486/686

Four Types of Projects

- Literature survey
- Implementation
- Algorithm Design
- Theoretical Analysis

- All of the above are fine as long as they are related to Artificial Intelligence

Literature Survey Examples

1. How is motion tracking and action recognition done with a depth camera such as the Kinect (Xbox 360)? (computer vision, machine learning)
2. What is the state of the art for computer go (search techniques), computer poker (game theory, machine learning), etc.?
3. How can we detect emotions in speech? (speech recognition, machine learning)
4. How can we automatically classify product reviews/blogs as positive or negative? (natural language processing, machine learning)
5. How are ads selected for advertisement by search engines and other websites (computational advertisement, game theory, machine learning)

Xbox 360 Kinect

- Microsoft Cambridge
- Body part recognition: supervised learning



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Depth camera

- Kinect



Infrared image



Gray scale depth map

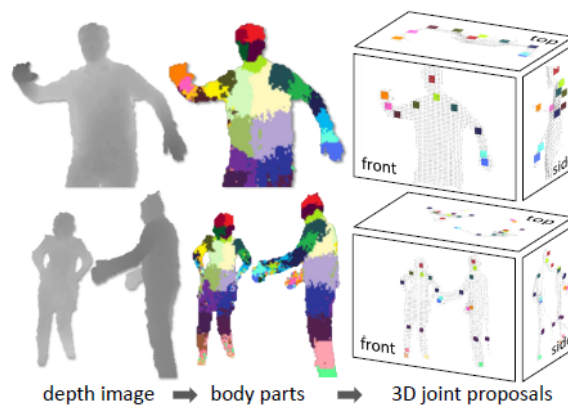


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Kinect Body Part Recognition

- Problem: label each pixel with a body part

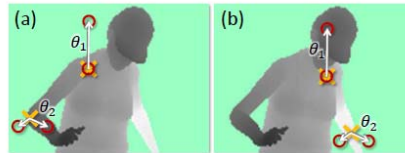


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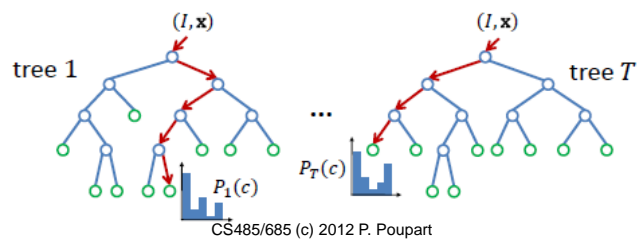
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Kinect Body Part Recognition

- Features: depth differences between pairs of pixels



- Classification: forest of decision trees

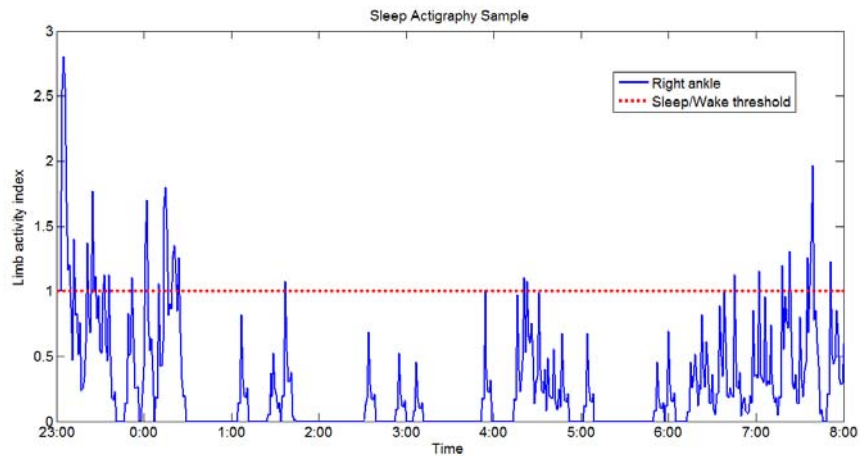


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Implementation/Algorithm design

1. Implement existing or new algorithms to automatically detect sleep segments from accelerometers attached at the ankles
2. Implement existing or new algorithms to play go, poker, etc.
3. Implement existing or new algorithms to recognize activities based on the accelerometer, gyroscope and compass in most smart phones.
4. Implement existing or new algorithms to extract entities from natural text

Sleep Actigraphy



Theoretical Analysis

- Show how to convert a partially observable Markov decision process (POMDP) into a deterministic planning problem and vice-versa
 - POMDPs and deterministic planning are both PSPACE-complete
 - But most people do not believe that you can use algorithms designed for one problem to solve the other problem
- References:
 - Littman, Majercik, Pitassi, Stochastic Boolean Satisfiability. *Journal of Automated Reasoning* 27(3): 251-296 (2001)
 - The computational Complexity of propositional strips planning, *Artificial Intelligence*, 69(1-2):165–204, 1994.