

Paper Review2:

Title: Egocentric Activity Recognition on a Budget

Summary:

- In this paper, the authors developed a reinforcement-learning model to generate a good policy for **saving the energy as long as without lowering the accuracy of the activity detection on wearable devices**. Based on the motion and vision data the author collected by the smart glass, the algorithm trades off between energy consumption and activity detection accuracy and generates good results.

Main points:

- Activity recognition results are different when using different wearable sensors
 - Vision sensors could get high quality of images and abundant information so as to detect the activity with high accuracy, but consume more energy
 - Motion sensors like accelerometer could detect the movement activities of a body like walking, running, but consume less energy, but cannot detect the activities lack of movement like sitting, watching tv
 - Vision sensors may get low quality images (blurred images) due to shaking or dark environment
 - **Assumption: it is true that vision sensors consume more energy than motion sensors when collecting data**
- Activity recognition using LSTM could generate good results
 - Video data was collected by camera
 - Sequence motion data was collected by accelerometer
 - **Assumption:** Why just use LSTM? Why not CNN? For image based activity recognition, if just use one image, could that work?
- Motion and Vision tradeoff using Reinforcement Learning
 - Action: motion method, vision method
 - Reward: based on energy consumption and accuracy between different method
 - Policy: Based on A3C and LSTM policy network
 - **Assumption: Due to the input with timestamp, so the gradient way is better the value-action way for policy learning**

Limitations:

- Experiment & Results
 - The authors conducted the experiment based on 20 activities, and the method could save energy. However, it does not consider that the prediction model will consume energy, if the model runs on wearables, it would consume much energy
 - The 20 activities are independent, in daily life, human usually act based on daily routine, if we can employ the information of the previous activity to predict the next activity, that could be useful
- How to detect the activities with high priority? Such as fall, eating?
- If we could know the duration of one activity, could we turn off the wearable sensors after detecting the beginning of the activity and wake up the sensors at the end of the activities?

New ideas:

- Consider the relationships between activities, and use that information for activity prediction
- For wearable devices, we can use more sensors like motion, audio, vision sensors to detect the activities and optimize the model
- The reinforcement learning and activity recognition/prediction model consume more energy, we can adopt other devices for help (Combine the wearables and edges together)

Reference papers to read:

- S. Song, V. Chandrasekhar, N.-M. Cheung, S. Narayan, L. Li, and J.-H. Lim. Activity recognition in egocentric life-logging videos. In C. V. Jawahar and S. Shan, editors, Computer Vision - ACCV 2014 Workshops, volume 9010 of Lecture Notes in Computer Science, pages 445–458. Springer International Publishing, 2015