CMPE-272 Ideas for Team Project

Yuan Wan

Project Idea-1:

1、 Project Title:

Streetlamp Energy-Saving System

2、 Project idea description:

This is a business project in which I participated developed by Chongqing Green Technology co., LTD in China from 2015-2018. In the project, the system collects environmental data, such as illumination, temperature humidity and PM2.5, uploads them to the server. After comprehensive calculation and overall processing, the brightness and color temperature of the street lights can be automatically adjusted (also can be monitored and maintained through the app), making road lighting more energy efficient and driving safety.

In this project, we use expert system to calculate the brightness and color temperature that satisfies the road environment well. Then I tried to learn about SVM(Support Vector Machine), which is a classic method in machine learning, and apply it on the system. I also wrote a paper as my graduation prerequisite to get the master's degree in China. It's as bellow:

Wen Junhao, Wan Yuan, Zeng Jun, Wang Xibin, Liang Guanzhong. Application of illumination clustering and SVM in energy-saving control strategy of street lamps[J]. Computer Science, 2019(7).

But in the half way I left the company and the research stopped. If conditions allow, I want to continue my research on the Streetlamp Energy-Saving System with SVM or other machine learning algorithms.

3、 Goal of the project (who are you developing the project for)

The project is to realize energy-saving on streetlamps. Usually the power of LED streetlight is 150W and 120W on the road and 60W in the tunnel. Urban road lighting consumes about 30% of China's total lighting power consumption. And If we can adjust the power of streetlamps according to traffic, we can save much energy. Also we can adjust the color temperature between white and yellow, which can help drivers to see the road more clearly in different weather.

4、 Technology stack:

Server: JAVA with Springboot + Mybatis + Mysql as the core framework. Algorithm may be SVM developed by ourselves or public framework like TensorFlow. We need more time to confirm it.

App: JAVA, Android Development Kit.

Terminal(already developed on the street light): C, uCOSIII

Additionally, if we want to do work on this project, I must get contact with the company first to ask for permit and devices.

Project Idea-2:

1、 Project Title:

Smart Home Control System

2、 Project idea description:

When I was an undergraduate, I created a startup and developed the system of smart home. Suppose that there was a virtual steward, who controlled lighting, curtains, TV, air conditioning, and monitoring, etc.

On the half way, we found smart home systems were not smart at all because traditional smart home companies, like Honeywell Siemens, were only good at embedded system. They didn't know what AI was, which must be the key in smart home system. We tried to figure it out, but we failed for we didn't know machine learning, too.

Now, AI algorithms for business project are more mature and I'm in Silicon Valley. So I want to try again with the help of Professor Ranjan, to make something that is really smart.

3、 Goal of the project (who are you developing the project for)

The main goal for smart home I think should be convenience, comfort and security for people. As an AI system, it should know what the master wants and prepare for him/her. For example, If the master comes to home, it should recognize the identity of the people and open the door and lights for the master if passed. When the master gets to the sofa, TV should be opened and favorite program should be selected. When the master wants to have a sleep in sofa, the system should turn down the light and TV.

4、 Technology stack:

Server: JAVA with Springboot + Mybatis + Mysql as the core framework. Algorithm framework will be TensorFlow.

App: JAVA, Android Development Kit.

Terminal(already developed): C, Zigbee.

Project Idea-3:

1、 Project Title:

Seeking Neighbors Strategy for Live Stream Transmission on P2P Network

2、 Project idea description:

This project is difficult for us and it's just a discussion. From 2018 to 2019, I was working on a live stream platform offering over than 200 English and Spanish TV channels, which was developed by a company in Shenzhen, China and its main market was South America.

Because the number of online users increases dramatically, our old system couldn't withstand a huge amount of stream data transmission, under which situation there would be a huge cost for servers and bandwith. I was assigned to join a group to develop a P2P stream transmission engine to replace the original engine, which push all the data for every TV terminal. Even traditional P2P technology is very mature, we still to make our P2P stream engine more efficient than others. First, we created a multi-way tree in the tracker server, which would calculate and assign nearest 30 nodes for each peer. Then the peer tried to make hole on the Internet and connect with neighbors by UDP.

The first layer of the multi-way tree is the root node; the second layer is the operator node; the third layer is the public network address; the fourth layer is the NAT1 address; the fifth layer is the NAT2 address; the sixth layer is the UPNP address; the seventh The layer is the local address; the eighth layer is the node information (that is, the leaf nodes of the tree, the storage node quality information, resource information, etc.). Each layer performs insert sorting based on IP (converted to INT integer) when constructing and inserting nodes. At the same time, a hash map <node ID, node information> is established for all nodes. When a node PeerA requests its neighbors from the tracker, the node information is obtained through the node ID, and then the node information is used to traverse the leaf node position of the seven-layer multi-tree in reverse order, searching for its siblings, and checking whether there are matching resources. , If there is, then add it to the node list; if not, search for its cousin node by the parent node. Until the threshold number is searched (30).

But the previous searching-nodes method only used the two dimensions of the public network IP logical distance and the degree of resource matching are used to search for neighboring nodes, and the node quality is not reliable. I think it we can apply RS(Recommender System) on the system with attributes as bellow

- Public network IP logical distance.
- Telecom operator type.
- The time of day.
- Weekly time of day.
- Resource ID.
- The maximum number of load nodes ever uploaded.
- Network Type.
- Transmission ability of shared resources.

The RS can be used to establish the list of recommendation neighbors. The similarity between nodes is calculated at 1-5 items, and the larger the 6-8 items, the better.

3、 Goal of the project (who are you developing the project for)

The goal of the RS method is to help the tracker assign better quality nodes to every peer, which can not only reduce the cost of servers and bandwith, but also provide more stable live stream data for customers.

4、 Technology stack:

Server: JAVA with Springboot + Mybatis + Mysql as the core framework. Algorithm framework will be TensorFlow.

App: JAVA, Android Development Kit.