To track the seating status, we can add pressure sensors for every table in the library. There may be some errors if we use the camera for face recognition. For example, if a student has an upset stomach and goes to the toilet for a long time, the face recognition system will decide that the student has left the library. However, the student may come back after one hour. Therefore, we can use the pressure sensor to avoid this error. Students do not take their documents or computer with them when they go to the toilet, so we can use the pressure sensor to determine if items are on the table. But simply using the sensor can also lead to errors, such as leaving something on the table when a student leaves, then the sensor will decide the student does not leave the table. To make a better determination, we can combine sensors and face recognition (camera) with doing this together.

For the hot density map

We can use the camera to do face recognition to determine how many students are in the area. Then we can combine all the determination information to formation a hot map.

Why server

We have two libraries (main library and law library), which may contain thousands of learning areas so that the amount of data generated every second is enormous. It is challenging for a single server to process these data. We can use a distributed system to address the problem to process this information faster. A distributed system is a system of hardware or software components distributed on different networked computers that communicate and coordinate with each other only through messaging. Distributed systems can provide the necessary power to handle expansive amounts of data [1]. We need several servers working together to take advantage of the distributed framework.

Reference

1. Kleinrock, L. (1985). Distributed systems. *Communications of the ACM*, *28*(11), 1200-1213.