will light a green lamp to tell the user it's time to put their bicycle in to parking site and the guide words will also be printed on the screen of lockset. After locking the bicycle rightly, S2➔ S3 is going to happen. The S3 is the storing state of the bicycle. Now, the user's bicycle is locked safely in the parking site and also under the monitoring of alarm system. Finally, Then S3➔S1, when the card reader confirms the correct information of the user. The lock will be open again and the parking site will be also available again in the record of controlling center.

B) Alarm Process I is a specific state, which includes two specific situations. One is the most common situation S2➔ S4. If the lockset detects that the lock stays at the S2 for a long time, then lockset will switch to the S4 and lights a red alarm lamp to notify staffs and users that the bicycle may be locked in an incorrect way. The other situation is simple, namely, the lock may still be opened. To solve the two situations, the administrators or users just need to press the "Cancel" bottom on the lockset to skip to the S1 and then relock the bicycles.

C) Alarm Process II is also a particular state and represents a quite emergency situation. When the lockset switches to S5 from S3, it means the lock is forcibly or illegally opened. In this state, the lockset will not only trigger the alarm bells and lamps but also send signals to controlling center to wake up SMS alarm system. Thus the users will receive the alarm message. In some particular conditions, the SMS alarm system can also notice polices directly. In addition, only administrators have the authority to switch the lockset back to S1. Thus, thieves are impossible to shut down the alarm system.

D. Deploy and Application of the System

The system is designed to deploy on campuses, especially the mega campuses. In the standard module, there will be several intelligent carports located dispersedly all over the place. Of course, we can set more carports near the specific places such as teaching buildings, dining halls and dormitories. What's more, it's considerably important to follow the willing of the residents in campuses. Therefore, we will have a deeply research in individual campus before choosing the addresses of the carports. Moreover, after the establishment of individual intelligent parking systems in different campuses, we plan to unite all the parking systems nearby, so that people can park their bicycles in different campuses, which will be supreme convenient. It is worth to note that the proposed system can not only apply on the campuses, but also contribute a lot at some specific places like commodities, mega playground such like Disneyland and also some small towns.

Therefore, the application of intelligent parking system contains enormous potential. In the future, based on the great advantages of our system, we can further develop a brand new bicycle rental service. To achieve this goal, we do not need to adapt our hardware a lot, and just need to implement the management of rental bicycles and accounting of rental fee in software. Therefore, the parking system is a developing but potential valuable product.

Although many companies have tried a lot on the emerging market of bicycle rental service, few projects succeeded finally. To avoid the similar tragedy, we plan to start our service at the campuses first, where people are well educated. Another great advantage of our application is that users' information is all based on one-card solution data banks, which is similar like credit card system in banks. Each individual has a reputation and credit record. The loss of damaged bicycles will be compensated by specific people. The more bad credit one gets, the less services he can gain.

In sum, the proposed intelligent parking system has a broad application prospect.

IV. CONCLUSIONS

With the increasing of the bicycle number in universities, the effective management of bicycles becomes a significant and challenging problem. To solve the problem, using the IoT technology, we design and implement an intelligent bicycle parking system. This paper introduces the architecture and modules of the system, and presents the methodology of system implementation. This system will be deployed on our campus. However, it is worth noting that this system can also be applied in other open places, such as Disneyland and also some small towns. In the future, we will further improve this system and try to apply it in other areas.

V. ACKNOWLEDGEMENT

The work is supported by the innovation practice program for the undergraduate of China (No:201210610166).

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