



## **Design of Smart Trash Bin Based on NB-IoT**

Yupeng Liu \*

Institute of Electronics and Communication Engineering, North China Electric Power University, Hebei 071003, China;

2450544081@qq.com

**Abstract:** This project studies and learns the emerging NB-IoT technology, and makes data acquisition and positioning system based on this technology. Independently designed and produced a physical sample that can achieve remote positioning and real-time data monitoring, to achieve the function of data acquisition and positioning. The goal of hardware circuit design is to produce a low-power msp430 development board, which includes: location data acquisition module design, narrow-band communication module design, etc. NB-IoT is designed for Internet of things applications with low bandwidth, low power consumption, long distance and large connections. Such devices are rarely used in life, but they add up to a significant amount of data that can be used for a variety of purposes, such as improving the configuration of urban equipment. By reporting in real time the capacity and smell of trash cans, it can help solve the problem of some garbage cans in cities being left unattended for long periods of time. By applying the Internet of things technology to improve urban public facilities, we have been inspired by the prospect of unmanned express delivery and unmanned supermarkets. In the future, garbage cans can also be placed intelligently and robots can recycle garbage.

**Keywords:** NB-Iot, Data acquisition and location, Smart bin.

### **1. Introduction**

With the competition of 5G standard, and the domestic HuaWei to 5G Internet of things standard began. NB-IoT technology standard was put forward in November 2016. Mature technology means that the future Internet of things technology will comprehensively change people's lives. As one of the pillar industries of the country, it is urgent to put forward improvement plans for existing problems. Trash cans in public places, a necessity of urban infrastructure, have barely improved in function over the past few decades, except for their increasingly beautiful appearance. Smart

city era, innovation is urgent.

## 2. Design instructions for smart bins

### 2.1 The overall design scheme

Three ultrasonic sensors are used to check the capacity of the garbage can under the semi-sealed condition, which is arranged in a linear line on the garbage can wall. The capacity of the garbage can can be checked in the host computer in real time, and the alarm will be issued when the garbage can is full.

An air detection module is installed on the top of the garbage can. When the garbage produces hydrogen, alcohol and other dangerous flammable gases, it will send an alarm to the upper computer to remind the garbage to be dumped. This part is mainly used to deal with specific dangerous emergencies, which can prevent fire and protect public safety.

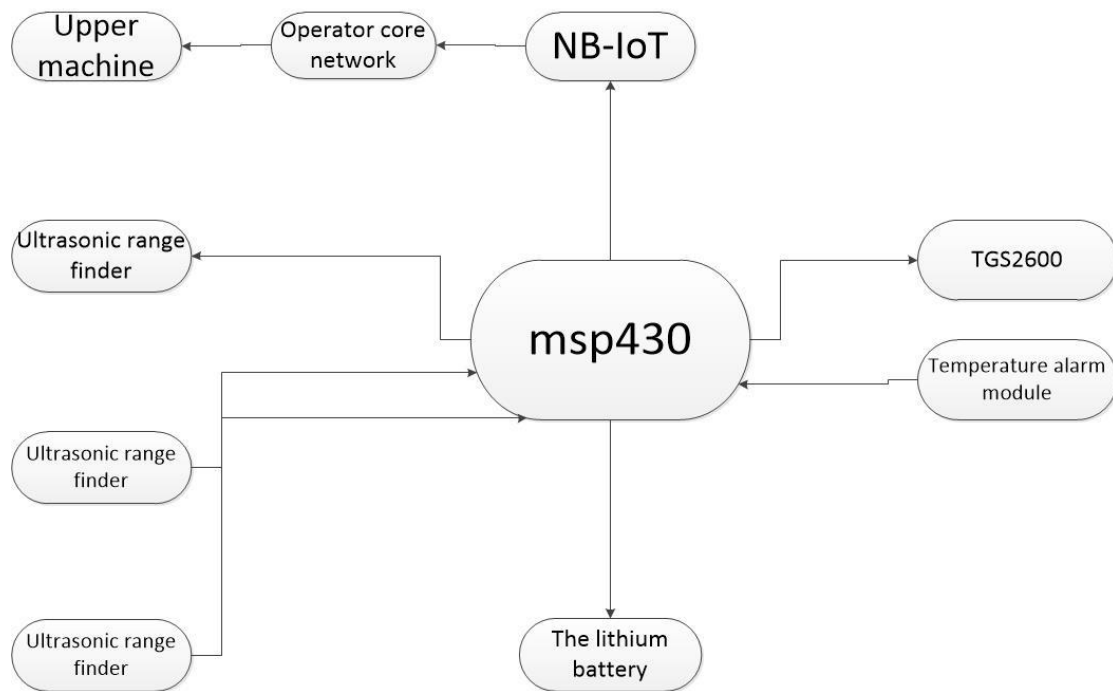


Fig. 1 The system connection diagram

### 2.2 Introduction of module functions

1. Capacity test: three ultrasonic sensors are installed in the inner wall of the bucket. The height of garbage accumulated in the garbage can be determined through programming, and these data can be sent to the service end uniformly
2. Solar panel power supply: lithium battery can be charged with solar panel, which is environmentally friendly
3. Public safety detection: TGS2600 air detection module is installed on the top of the bucket. When there are flammable and explosive gases such as alcohol and gasoline and unextinguished cigarette butts in the garbage can, the returned value will increase

and can be moved

4. Positioning module: the coordinate information of the bucket can be obtained at the server end, so as to obtain the specific location of the bucket

5. Temperature detection: timely notify relevant personnel when garbage is at high temperature to prevent fire

Recycling trash is a frequent and simple process for garbage collectors. Through garbage pretreatment, the fluffy garbage in the garbage can be compressed to reduce the space occupied by garbage, so as to improve the utilization rate of garbage can. Garbage can is the bottom equipment of the whole garbage disposal network. With the help of the garbage can pretreatment process, the operation load of the whole garbage network can be greatly reduced, and the efficiency of garbage disposal can be significantly improved.

The recycling industry is now facing an awkward situation in which recycling bins are a mess, with some small rubbish stations manually picking out what can be recycled from their piles, while others are buried regardless of whether they can be recycled or not. In fact, we found that garbage in different places has different values. In shopping malls, there are often a large number of plastic bags and other recyclable garbage in trash cans, while in residential areas, garbage cans are mainly kitchen waste, with less available parts.

Garbage standardization is we put forward a solution, we classify the garbage recycling ratio according to different places, after pretreatment by compressing a barrel junk quality is roughly same, we put the rubbish label according to the origin, provide them with different recycling center, high proportion of the recyclable garbage, will get more detailed processing, and some of the stench of garbage will be to the machines for processing, from the macroscopic Angle to solve the part of the contradictions in the garbage disposal.

The design of product appearance

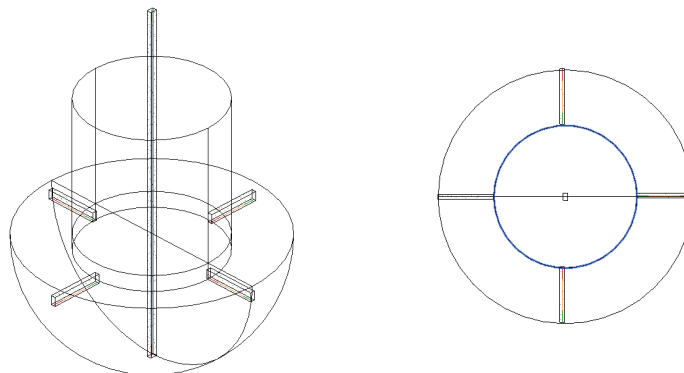


Fig. 2 The design of product appearance

It is suitable for square and business area, which solves the problem that trash can is

easy to kick down and can't be thrown properly. And added a compression function to solve the problem of garbage bin standardization. The bottom of the barrel adopts the sealing structure, and there is a lifting platform for compressing garbage inside. The entire bottom of the bucket can be filled with garbage, which solves the problem that some of the garbage will be thrown out of the garbage can by providing more reception space.

### **3. Conclusion**

The objective of this project is to study the emerging nb-iot technology and make data acquisition and positioning system based on this technology. Independently designed and produced to achieve long-distance positioning of anti-loss and anti-theft physical samples, data acquisition and positioning functions. Hardware circuit design includes: location data acquisition module design, narrowband communication module design, etc. Nb-iot is designed for Internet of things applications with low bandwidth, low power consumption, long distance and large connections. Such devices are rarely used in life, but they add up to a significant amount of data that can be used for a variety of purposes, such as improving the configuration of urban equipment. The parts that can be improved in the future include: more efforts can be made on the appearance and the installation of components, so that the model is closer to the product that can be used; You can add some preliminary garbage disposal, add some mechanical structure, and make it more convenient.

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