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# Development and Application of 3D Printing Service Platform under the Background of Internet

**Bing Li**

Urumqi Vocational University, Urumqi 830002, Xinjiang, China.

***Abstract:*** With the development of the times, the Internet has been greatly developed, because with the development of modern life, people's material standard of living requirements is getting higher and higher, so some people suddenly wonder, the Internet and traditional enterprises to join forces to conveniently enrich our lives. As a new technology in modern society, 3D technology has the function of printing things anytime, anywhere, and is sought after. Therefore, the purpose of this paper is to develop and apply the 3D printing service platform based on the Internet background. After understanding the history of 3D printing technology and the demand and ownership of 3D printing in recent years, we compared the existing technology, using the Internet platform and a variety of intelligent algorithms to build the service platform, to conduct experiments. Experimental results show that the 3D printing service platform based on the Internet background can meet the needs of some people and facilitate people's lives.

***Keywords:*** 3D Printing; Service Platform; Internet; Technology Research and Development

## 1. Introduction.

3D technology is one of the new emerging technologies in recent years. Its main feature is that it can print what people want anytime and anywhere, and can meet the demand of insufficient parts in the future. For example, artificial heart, artificial bone and other consumables that cannot be stored in large quantities or in small quantities. However, in the current situation, 3D printing technology is not mature, printing speed is slow, and consumables are special. So far, it is still regarded as a conceptual technology and has not been put into real life. Therefore, 3D printing's current position in the world is just like chicken ribs, and its demand is small, but it can't be abandoned. Therefore, our plan is to open a 3D service printing platform. By storing some 3D printing machines in various places, some customers in need can place orders on the Internet through the self－service platform or describe the requirements of the required items to the manual customer service to meet their needs. Then, after the 3D printing machine has finished printing, you can choose the way of manual delivery or door－to－door pick－up to take away the printed items, so as to meet the needs of people's production and life.

3D printing technology first appeared in 1980. So far, due to the rapid development of 3D printing technology, great progress has been made in various fields, and it has become an effective means of modern model, mold and parts manufacturing. Titanium alloy 3D printing has even been applied in aerospace, automobile and other fields. But these are all used in industry. In modern life, 3D printing has also begun to participate in personal application shopping malls, and 3D printing technology has become an important means for consumers to participate in manufacturing. Customers participate in the product design of their own creative products, and then print them through 3D printing technology to show their creativity to people. This means that 3D printing technology has a certain way of consumption in the personal market, which shows people the business opportunities brought by 3D printing.

Due to the high cost of 3D printers and the special printing materials, it is impossible to supply 3D printers to every household. Moreover, unlike ordinary printers, 3D printers are not in wide demand, so we can't even see 3D printers in some small places. Therefore, we see a new business model, that is, a complete industrial chain of materials, equipment and services. We only need to operate our own equipment and network self-service platform, so that people in need can increase our order volume and fulfill their needs through online orders, killing two birds with one stone. Therefore, the purpose of this paper is to make a 3D printing service platform through the Internet, test it and put it into real life.

## 2. Distributed algorithms and modeling

We think of data storage as charging for experimentation. Distributed energy storage aggregation model.

Mathematical model of energy storage. Absorption of reactive power when energy storage is charged, SOC increases; The SOC is reduced by the amount of power that is released during discharge. The value of the t-moment is calculated as $SOC_t$ .

$$SOC_t \begin{cases} SOC_0 + \left(\frac{P_{ch}\eta_{ch}}{S_{rate}} - \frac{P_{dis}}{\eta_{dis}S_{rate}}\right)\Delta t, t=1 \\ SOC_{t-1} + \left(\frac{P_{ch}\eta_{ch}}{S_{rate}} - \frac{P_{dis}}{\eta_{dis}S_{rate}}\right)\Delta t, t>1 \end{cases} \quad (1)$$

Type: $SOC_0$SOC value for the first moment of energy storage; And respectively, t to t-1 period between the charging and discharge power, the maximum can only be one not 0; and charge and discharge efficiency respectively; The t is a continuous period of charge and discharge; The rated capacity for energy storage. $P_{ch}P_{dis}$ $\eta_{ch}\eta_{dis}S_{rate}$

Energy storage is generally through the PCS (power conversion system) into the power grid, in the absorption or distribution of active power at the same time, can also absorb or emit reactive power, can provide a certain amount of reactive support and voltage management role to the grid. Its reactive power can be controlled as available during actual operation.

Constraints for energy storage. The constraints of energy storage include SOC constraints and charge and discharge constraints. The SOC constraint is

$$SOC_{min} \leq SOC_i \leq SOC_{max} \quad (2)$$

and are $SOC_{min}$ the minimum and maximum values allowed by the energy storage SOC, respectively. $SOC_{max}$

The charge and discharge constraints are

$$\begin{cases} 0 \leq P_{ch} \leq P_{chmax} \\ 0 \leq P_{dis} \leq P_{dismax} \end{cases} \quad (3)$$

$P_{chmax}$ and the maximum charging power and the maximum discharge power for energy storage, $P_{dismax}$ respectively.

Power distribution for distributed energy storage. In this paper, multiple energy storage is aggregated into an equivalent centralized energy storage for scheduling center to schedule. Only one centralized energy storage charge and discharge variable is required for scheduling optimization calculations. In order to make the power distribution reasonable and maintain the relative equilibrium of the SOC during the scheduling process, the power rating and SOC value of each storage energy are used to determine its charge and discharge power. This is determined by:

Charging:

$$\begin{cases} \frac{P_{ich}}{P_{irate}f_{ch}(SOC_i)} = \frac{P_{jch}}{P_{jrate}f_{ch}(SOC_j)}, \forall i,j \in N \\ \sum_{i=1}^{N} P_{ich} = P_{allch} \end{cases} \quad (4)$$

Discharge:

$$\begin{cases} \frac{P_{idis}}{P_{irate}f_{dis}(SOC_i)} = \frac{P_{jdis}}{P_{jrate}f_{dis}(SOC_j)}, \forall i,j \in N \\ \sum_{i=1}^{N} P_{idis} = P_{alldis} \end{cases} \quad (5)$$

The $P_{irate}$ rated power of the energy storage i; and the charging and discharge power of energy storage i respectively; And the total charge and discharge power for scheduling demand; N is the total number of energy storage; And are the charge and discharge SOC functions for energy storage, respectively. $P_{ich} P_{idis} P_{allch} P_{alldis}$ $f_{ch}(x) f_{dis}(x)$

In order to make SOC lower energy storage more charge less, SOC higher energy storage energy less charge more. In this paper, the sigmoid function is scaled, panned and so on transformed as a charge and discharge SOC function for energy storage. The expression of the specific charge and discharge SOC function is

$$\begin{cases} f_{ch}(x) = 1 - \dfrac{1}{1 + exp^{-20(x-0.5)}} \\ f_{dis}(x) = \dfrac{1}{1 + exp^{-20(x-0.5)}} \end{cases} \quad (6)$$

The selected charge and discharge SOC function can make SOC's higher energy storage charging power small, discharge power is high, while SOC's lower energy storage charging power is high and discharge power is small, realizing the reasonable distribution of total charge and discharge power between the various energy storage.

## 3. Experiment

### 3. 1 Experimental process

We start by watching books about platform construction, and then model by selecting a variety of appropriate algorithms. Finally, we can use distributed algorithms to model it, and it is the most effective. Then we started to simulate the experiment and came up with the experimental data.

### 3. 2 Data processing

We measure many sets of data through experiments, perform unified analysis and processing, and then analyze the validity of the measured data by linearly coupled regression model. The valid data is eventually extracted and modeled.

## 4. Evaluation results

### 4. 1 Comparison of experimental results

**Table** 1. A comparison of differences between service platforms

| | Order Error Rate | The rate of leakage | One success rate |
|---|---|---|---|
| Distributed algorithms | 3% | 0. 3% | 93. 6% |
| Genetic algorithms | 12% | 0. 4% | 83. 1% |
| The aggregate algorithm | 8% | 0. 1% | 72. 4% |

According to the information given in Table 1, the difference between the three algorithms is small in the leakage rate, but the gap between the order error rate and the one—time success rate is large, the order error rate of the distributed algorithm is only 3%, and his one—time success rate is 93. 6%. But the order error rate of the genetic algorithm is 12%, its one — time success rate is only 83. 1%, while the order error rate of the aggregate algorithm is 8% and its one—time success rate is only 72. 4%. Although the leakage rate of all three is less than 0. 5%, and the leakage rate of the polymer algorithm is a small difference of 0. 1%. However, due to its high order error rate and low success rate, we finally decided to choose distributed algorithms as our platform to build algorithms. After I have come up with the above results, our next experiment is mainly focused on checking the order error rate, the leakage rate and the reasons for not being successful once, in order to achieve better experimental results.

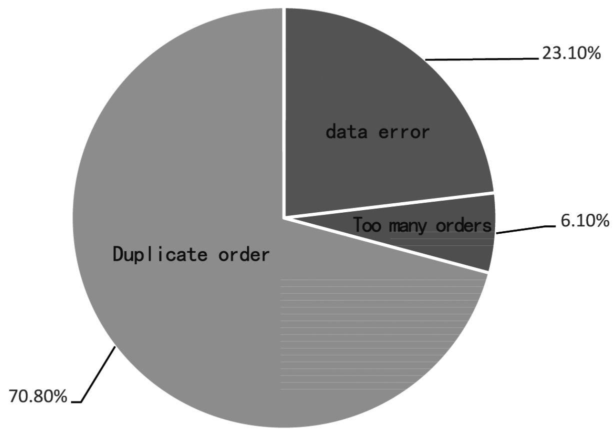


**Figure 1.** The main problem with missing orders

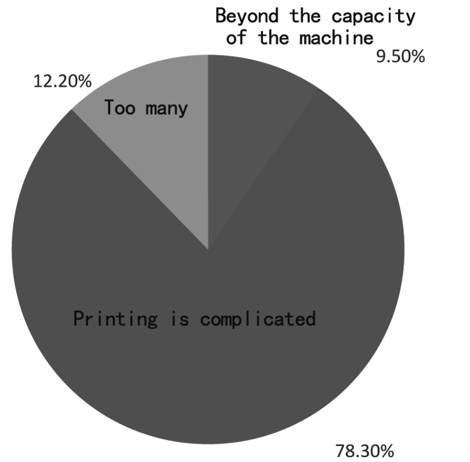


**Figure 2.** A problem with a failed construction

According to the results of the experiments in Figures 1 and 2, we found that the main problems with missing orders were data errors, over—orders, and order repeats, which accounted for 23.1%, 6.1% and 70.8%, respectively. So, we can see that the main reason for the leak is because too many orders are repeated, resulting in the lack of data displayed on the platform so that the leak. So, in order to solve this problem, our main thinking is about the lack of data causedby order duplication. Because we use a distributed algorithm, it divides the items of different needs into several categories and stores them in each node. Therefore, this will spread the problem of excessive order volume, but this will also lead to the same order quantity is too large, resulting in the problem of missing orders. Because items with the same order accumulate on a node, it is sometimes possible that the node cannot withstand so much data that a crash results in a data loss, which is our last experimental result. The problems of one printing failure are mainly beyond the capacity of the machine, the printing items are too complex and too many problems, their proportion is 9.5%, 78.3% and 12.2%, respectively. We can see that although the machine suffers only 9.5% of the causes of failure. But we also get some reasons from this, that the machine should not work too long, the middle of a period of rest to cool the internal parts of the machine cooling to reduce the machine operating pressure. Second, if the number of prints at that time also can cause the machine because the order processing is too busy, resulting in the printing of items, but the main reason is because the printed items are too complex. Because the 3D printers we buy are not the best on the market, they are generally used for commercial 3D printers, so there are some parts that are too precise for us to print yet. So, in the future we will be purchasing two commercial—specific 3D printers to handle some overly sophisticated printed items to complete the order.

## 4.2 3D printing

3D printing is one of the fast—forming technologies. It is mainly based on digital model files, using adhesive materials such as powdered metals or plastics to construct objects by layer—by—layer printing. 3D printing is usually done with a dedicated digital material printer, and was first used to save materials since the model was created, and later gradually used in the direct manufacture of some products to create the required components. For example, aerospace, automotive and other industrial fields. It gradually spread to other fields, such as medicine and education. 3D printing technology first appeared in the mid—1990s, and the main difference between it and ordinary printing is that its printing materials are viscous materials such as liquids or powders. By connecting it to a computer, we accumulate layers of printed material, and finally convert the images on the images into real solid matter. Over time, 3D printers have been able to print more and more things. From the first car printed from a 3D printer to the first 3D—printed aircraft, to the discovery of artificial liver tissue, 3D—printed pistols, artificial spines and even 3D—printed hearts, the concept of 3D printing is growing to cover everything that is built from basic materials. The principle of 3D printing is basically the same as that of a normal printer, but the material used to print is different. Because ordinary printer materials are ink and paper, and 3D printer printing materials are metal, plastic and other different adhesive materials. So, 3D printer is actually a reference to the technical principles of ordinary printers, so we also call 3D printing technology for 3D stereoscopic printing technology. There are many different techniques in 3D printing, but they differ in the way the materials are used and the different components are built at differentlevels.

## 5. Conclusion

Although 3D printing technology is not the mainstream industry in the printing industry, 3D printing technology has a high strategic role in the industrial field. Because it can meet some of the main materials missing manufacturing. For example, aerospace aircraft a part of the key indispensable but demand is not a large part of precision materials, because the demand is small does not need to be dedicated to a day's production line waste resources, but must be produced, so at this time 3D printing technology is of great use. Although there is a lot of demand for 3D printing technology in the industrial field, 3D printing technology has just emerged in the commercial process, and not many people are using it. However, we believe that with the maturity of 3D printing technology and the development of 3D printers, 3D printing will be the mainstream manufacturing model of the future. It will replace some parts from factory production to 3D printing anytime, anywhere to meet the needs of modern life. After all, the ultimate service for all commercial industries is people, and the core of 3D printing technology is convenience, so we believe that in the future 3D printing technology will be better and better.

## References


1. Srinivasa P, Abdul K, Sujatha G, et al. 3D printing in dentistry. Journal of 3D Printing in Medicine 2018; 2(3): 89—91.
2. Garcia J, Yang Z, Mongrain R, et al. 3D printing materials and their use in medical education: a review of current technology and trends for the future. Bmj Simulation & Technology Enhanced Learning 2018; 4(1): 27—40.
3. Raney J, Compton B, Mueller J, et al. Rotational 3D printing of damage — tolerant composites with programmable mechanics. Proceedings of the National Academy of Sciences 2018; 115(6): 1198—1203.
4. Aquino R, Barile S, Grasso A, et al. Envisioning smart and sustainable healthcare: 3D—printing technologies for personalized medication. Futures 2018; 103: 35—50.
5. Liu D. Research on the construction of fitness service platform in colleges and universities. International Core Journal of Engineering 2020; 6(4): 110—114.
6. Farooq U, Park S, Khang G. A smart wellness service platform and its practical implementation. Computers, Materials and Continua 2020; 66(1): 45—57.
7. Chen N, Li H, Fan X, et al. Research on intelligent technology management and service platform. Journal on Artificial Intelligence 2020; 2(3): 149—155.
8. Xie Z, Cao X, Liu Y, et al. Decisions on investing social funds in technology research and development based on cognitive psychology. Neuro Quantology 2018; 16(6): 397—404.
9. Aggarwal, Aradhna. The impact of foreign ownership on research and development intensity and technology acquisition in Indian industries: pre and post global financial crisis. Social Science Electronic Publishing 2018; 35(1): 1—26.
10. Alderson D, Doyle J, Willinger W. Lessons from "a first—principles approach to understanding the internet's router —level topology". ACM SIGCOMM Computer Communication Review 2019; 49(5): 96—103.