

---

# Design of the break yarn online detecting system for textile machine

Xiaohe Yan

Wenzhou Vocational & Technical College, Wenzhou, 325035, China

xiaohewelcome@126.com

---

## Abstract

In order to detect and control the break yarn of the textile machine, We design a system of the break yarn online detection and control, the system based on STM32 MCU. and analyze the hardware circuit and software circuit of the system. then debug the system. This system realizes the break yarn online detection and improves the intelligence of the break yarn online detection.

## Keywords

Textile machine; the break yarn; design; detection module.

---

## 1. Introduction

In the warp of textile machine, the yarn is in the state of high-speed movement, the yarn broken is unavoidable. If the break yarn is not changed, it will produce defects on the fabric, which will affect the quality of the fabric. Therefore, the machine must be controlled and treated before the break yarn end enters the textile machine. so the break yarn online detecting should be studied.

## 2. System Structure and Function

The textile process of a textile machine is introduced into the warp machine through a frame, and then warping. Because the yarn is thin and many, and the yarn is moved at a high speed during the whole process, the yarn is broken from time to time. When there is a break yarn, stop the machine in time and deal with the break yarn. The working process of the machine is as follows:

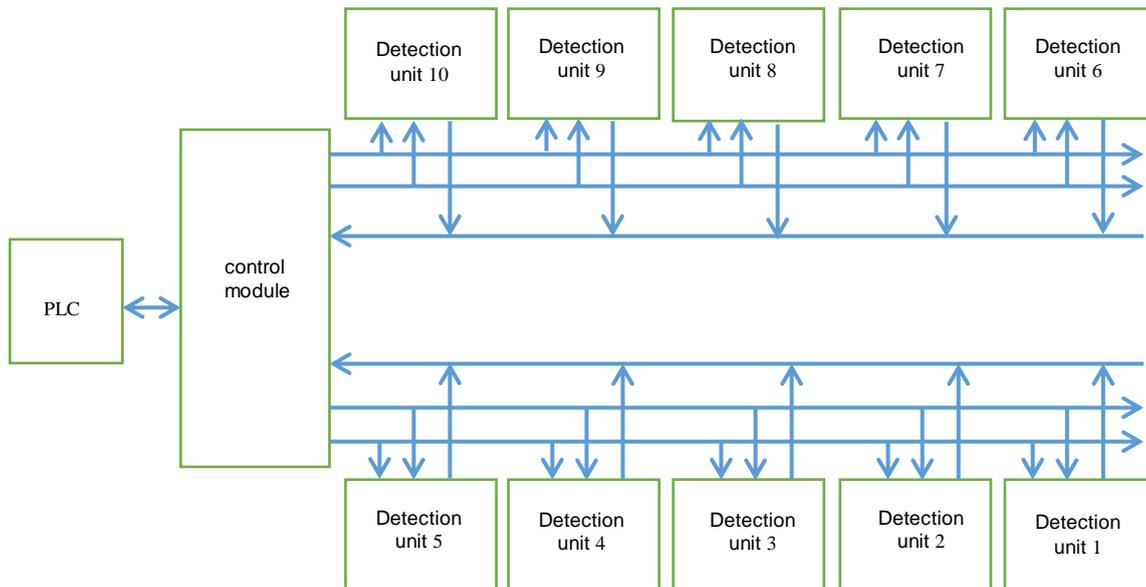
When the power supply is connected to the textile machine, the working indicator light is on. When the machine start button is pressed, the working indicator light is out and the textile machine starts to work.

the textile machine is working if abnormal conditions occur. the working indicator lights start to flicker, and The machine sends out alarm signal. At the same time, the control module sends out stop orders, and the textile machine stops working.

After the yarn is repaired, the staff press the machine start button, the working indicator lights out, and the textile machine continues to work.

According to the functional requirements of the break yarn online detecting, the control system of textile machine breaking mainly includes the break yarn online detecting module, signal processing module, control module with STM32 as the core, alarm module, display module and so on. The system design diagram is shown in Figure 1. the sensor of the break yarn online detecting module is composed of infrared transmitting and receiving, and shown in Figure 2. If the yarn is placed between infrared transmitting and receiving, the mechanical vibration of the yarn during its movement will affect the infrared received by the infrared receiving tube. The mechanical vibration of the yarn during travelling will affect the received infrared ray. The output AC signal of the sensor can be designed with the same frequency as that of the vibration of textile machinery. If the yarn is broken, the





#### 4. System Software Circuit Design

The control module of the system is programmed in C language, which can greatly improve the efficiency of writing. The key of software implementation is the break yarn online detecting. If there is a fault in the process of self-inspection, the program stops at the detection state and reports the specific fault type and location to the system, which is displayed by the system display screen to facilitate the specific treatment of workers. After troubleshooting, the program continues to run until the end of self-inspection. The host controller sends commands to the slave to notify the whole system to enter the status of disconnection detection, and real-time detection of disconnection information. The flow chart of the main program is shown in Figure 4.

#### 5. System debug

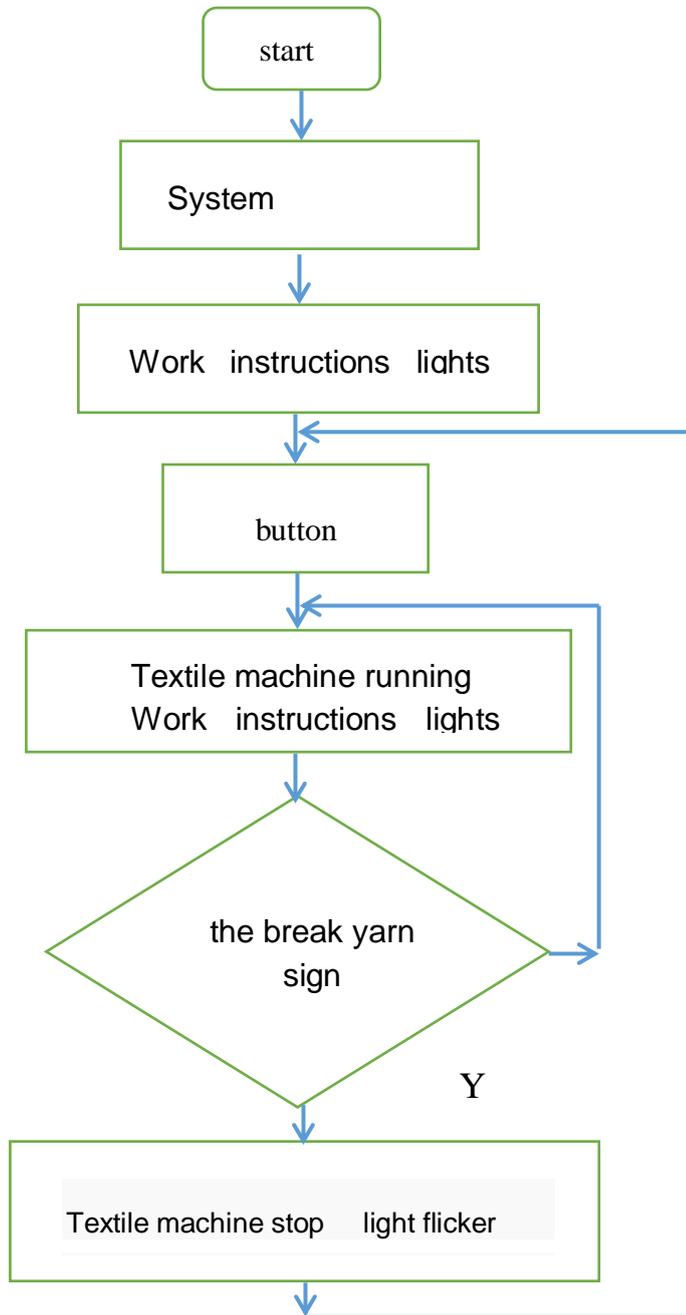
Information of machine parameters provided by customers. In order to complete the circuit test, a set of device simulating yarn motion is made in the laboratory. The device consists of a high-speed motor and a yarn frame, which is filled with yarn with a diameter of 0.3mm provided by the manufacturer. The high-speed motor drives the yarn through an eccentric shaft. When the test device is started, the yarn will produce high-frequency mechanical vibration under the high-speed rotation of the motor. The vibration frequency and amplitude conform to the working environment of the machine.

##### 5.1 Debugging detection Program

At the beginning of debugging the detection system, the system is not stable, and it is easy to report the wrong disconnection information, and when the disconnection is connected, the index light does not update. Through one-step debugging and analysis of the program, it is found that the reason is that the time of yarn scanning is too short, which leads to the misjudgment of the program caused by the missing detection of yarn vibration pulse. At the same time, the display program does not refresh the normal working data, resulting in the indicator display not update. Through the modification of the program and some structural adjustment, when an yarn breaks in the new test, it flickers and holds tightly from the machine headlamp. At the same time, it lights up the indicator lamp for the breaking position. When the yarn is normal, the system runs normally and the state of no mistake is reported. Verify that the disconnection detection meets the requirements.

### 5.2 Communication command debugging

In this design, the SPI communication clock is set to 200 kHz. Under this clock, the clock and data are synchronized and the communication is good. The SPI receiving data waveform is shown in Figure 5. The upper waveform in Figure 5 is a serial clock, and the lower waveform is a data waveform. From Figure 5, we can see the synchronization of the data and the rising edge of the clock. Data is sent and received correctly.



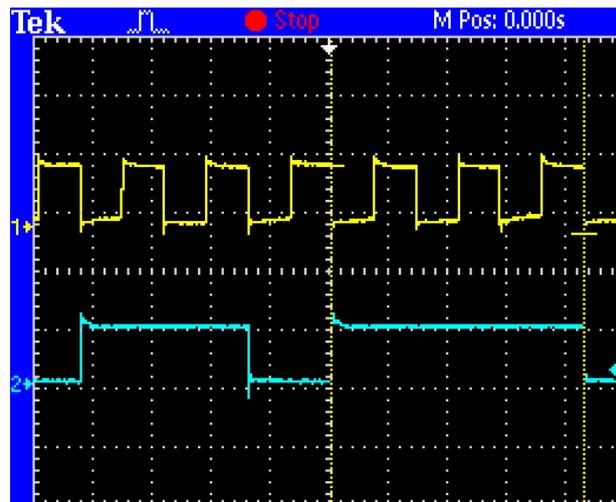


Figure 5 SPI Data Receiving Waveform

## 6. Conclusion

This system is different from the traditional broken yarn detection system, using infrared detection technology, and some new detection methods, so that the broken yarn detection can achieve non-contact, while improving the accuracy and sensitivity. At the same time, the system can display the position of the broken yarn for the convenience of operators. It greatly reduces the maintenance personnel on the production site and avoids the waste of human resources. At the same time, it will also improve production efficiency, have good practicability and market potential.

## References

- [1]Huang qilan Qin weigang Yang gongyuan .Design and Realization of a new kind of the yarn online detecting instrument. International Conference on Computer Application and System Modeling , 2010: 106-107.
- [2]Qin weigang. Application of PLC communication in Yarn quality online Detecting,[J] Micro computer information, 2008: 67-68
- [3]FU Hao,JIANG Tong,CUI Yan,LI Bin.Design and Operational Strategy Research for Temperature Control Systems of Isothermal Compressed Air Energy Storage Power Plants[J].Journal of Thermal Science,2019(02):204-217.
- [4] Congshan Li,Jian Guo,Ping He,Yukun Tao,Cunxiang Yang,Youyi Wang.An LCC-HVDC Adaptive Emergency Power Support Strategy Based on Unbalanced Power On-Line Estimation [J/OL]. Journal of Harbin Institute of Technology(New series):1-1 4[2019-03-26]. <http://kns.cnki.net/kcms/detail/23.1378.t.20190318.1314.004.html>.
- [5] Peng Jiang,YouLing Yue,HengQian Gan,Rui Yao,Hui Li,GaoFeng Pan,JingHai Sun,DongJun Yu,HongFei Liu,NingYu Tang,Lei Qian, JiGuang Lu,Jun Yan,Bo Peng,ShuXin Zhang,QiMing Wang,Qi Li,Di Li.Commissioning progress of the FAST[J/OL].Science China (Physics, Mechanics &Astronomy):1-22[2019-03-26].<http://kns.cnki.net/kcms/detail/11.5849.n.20190322.1415.002.html>.