A new type of Embedded **Autolevelling Control system based on ARM microcontroller** for Carding Machine

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Presented at:
IEEE Conference on Industrial Electronics and Applications (ICIEA 2006)
Topics

1. Carding Machine & Auto leveller

2. IPC based Autoleveller (existing system)

3. ARM based Autoleveller (new system)
   - Hardware development
   - Software development
Carding Machine [1]
Carding Machine

• Carding machine converts cotton to sliver. Sliver is bundle of fibre that is used to spin yarn

• The rotating speed of rollers has great influence on quality of output yarn

• Bad control can lead to low strength, poor degree of evenness and bad quality yarn
Autoleveller

• It is a control system which detects change in thickness of output sliver

• It adjusts the rotating speed of feed roller & draft roller
Carding machine & Auto leveller

Fig 1 Structure Diagram of Carding Machine and Autolevelling Control System (1 Fed-in Layered Cotton; 2 Displacement Sensor; 3 Feed Roller; 4 Cylinder; 5 Proximity Switch; 6 Displacement Sensor; 7 Fixed Roller; 8 Draft Roller; 9 Doff; 10 Photo-electricity Sensor)
IPC based Autoleveller

- IPC = Industrial-grade Personal Computer
- It is the prevalent form of implementing autoleveller

- System: IPC PCA 6753
- Interfaces:
  3-channel A/D converter
  2 counter inputs
  3 serial communication ports
System is divided on 3 interface boards:

1) Data acquisition Control board PC-7483
2) Digital I/O board ACL-7125
3) Multi serial card CI-132 (for RS-485 ports)

This system is connected to PLC via RS-232. A touch screen is used for user commands.
IPC based Autoleveller control system
ARM based Autoleveller embedded system

Need:
IPC based system is big, costly, power consuming & has poor flexibility

SoC : S3C44B0
Processor : 32-bit ARM7 TDMI
SoC peripherals

2MB Flash memory
8MB RAM
2 channel UART
8 channel 10-bit ADC
8 external interrupt sources
LCD controller
IIC bus controller
Watch dog timer
RTC
ARM based Autoleveller embedded system

Interfaces to SoC:

1. Memory chips: for main memory, program memory, EEPROM for user information & other data.

2. Serial driver chip: contains 4 RS-485 ports

3. High speed counter: to calculate motor speeds

4. A/D converter: to interpret sensor data

5. I/O control: for general control signals
ARM based Autoleveller hardware
1. Initialization
   • On-chip peripherals: interrupts, general I/O, watchdog timer, etc
   • External peripherals: RS-485 serial ports, frequency inverter, 8254 timers, PLC, touch screen

2. Data acquisition: cotton thickness, roller speed

3. Real-time control: adjusting roller speed

4. Performance display: parameters like cotton thickness, roller speed
Fig 10 Monitor Page in Touch Screen
5. Data storage: storing important parameters in EEPROM
References

1. Old Mills (oldmills.scificincinnati.com)
2. IEEE Xplore