Unified telescope control system

M.Medvedskyy

Main astronomical observatory of National Academy of Science of Ukraine

medved@mao.kiev.ua
The telescope TPL-1
The specific of this telescope

- Must to track the satellite
- Alt azimuth mounting
- This telescope are using the step motors
- This telescope are using the encoders
Elevation encoders in Kiev
Azimuth encoder in Riga
HEIDENHAIN manufacture
Azimuth motor
What need the observer from telescope control system

• - maximum convenience
• - minimal operator interaction in the operation of the system
• - reliability
• - as much as possible of the work assign to the system (maximum automation)
What you need to know telescope control system to track the object

• 1- know where the object is now
• 2- know where "looks" telescope
• 3- know where the object is through a specific length of time (to ask what speed)
What you need to know how the telescope control system to track the object

• 4 - control the telescope drives
• 5- interact with the observer
The parts of control system

- GPS
  - Time&freq
- AZ encoder
- EL encoder
- Freq. sintez. AZ
- Freq. sintez. EL
- sync. module
- microcontroller
- Main computer
- Rot. Mirror control system
1- know where the object is now

• It must be the exact time and object ephemeris

• ephemeris is stored in the computer's memory

• the exact time of every 100 ms
2- know where "looks" telescope
3- know where the object is through a specific time interval

- efemerida memorized Computers,
- Computer interpolates the position of the object the next time \((T + 100 \text{ ms})\)
4 - control the telescope drives

- GPS
  - Time & freq
  - 10 MHz

- Frequency synthesizer
  - 10MHz
  - 10 Hz

- Microcontroller
  - Freq. Code 3 bytes
  - Az El

- PC
  - RS232

- Az motor
  - Faz

- El motor
  - Fel

- The synchronization module
5- to communicate with the observer

Remote Control (joystick) -> microcontroller

microcontroller -> RS232 -> PC
CPU
CLK generator
synthesizer
Parameters frequency synthesizer

- Step frequency tuning at the frequency:
  - 50Hz  –  0.00025Hz
  - 5000 Hz  –  2.5Hz
- The feature synthesizer - when you change the output frequency is not going break period!
- There are the possibility to work with external frequency (more higher accuracy)
Az encoder adapter
El encoder adapter (ver.4)
El encoder adapter (ver.5)
All parts
The software for test all parts
conclusion

• This system can be individually modify to unique telescope equipment.
• This system is fool autonomous (time & frequency).
• This system are using standard interface RS232 or USB under different operation system
Thank you for your attention