

Safety Issues of Remote Control in Railway Signaling

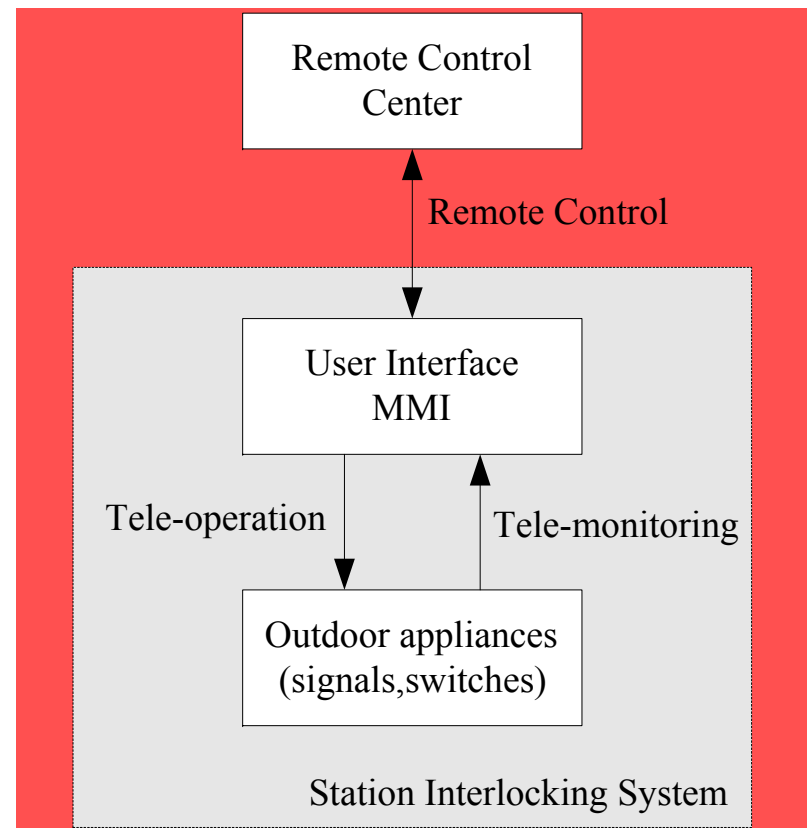
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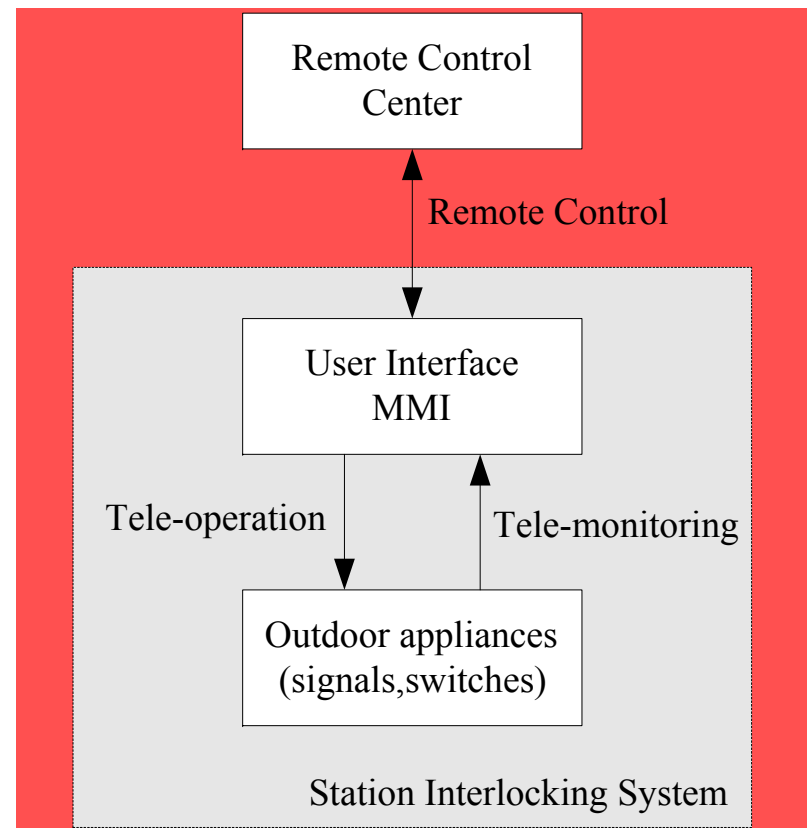
Tele-operation and tele-monitoring

- Interlocking system: dependency between signals and switches.
 - Signals and switches are placed far from the interlocking system.
- Safe tele-operation and tele-monitoring



Remote control

- Rationalization
 - Staff reduction
 - Control of larger areas from a single center
- Remote control
- Unified operating of different interlockings
 - Highest safety level



Three-level operation control

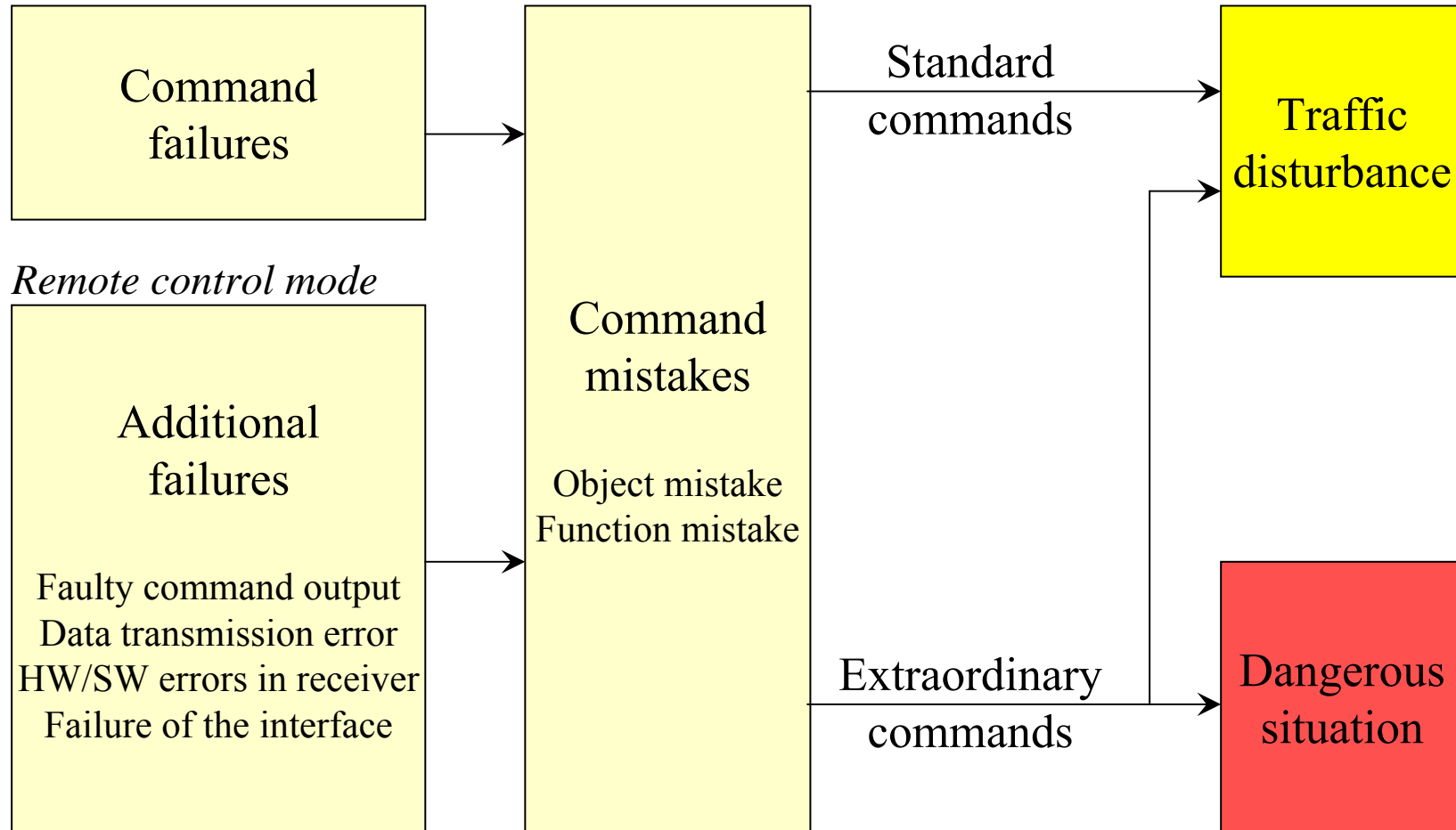
- Safety Level
 - Level of the station and open-line signaling systems
- Operative Control Level
 - Control and automation of the operation of the safety level of a region from a remote control center
- Dispositional Control Level
 - Level of over-region decisions on trains, engagement of resources etc.

Standard and extraordinary commands

- Standard command
 - Carried out under full safety coverage of the interlocking system
- Extraordinary command
 - Safety responsibility is taken over by human operator (only in case of abnormal operation)

Consequences of command faults

Local mode



Safety of command direction

- Means to avoid command mistakes
 - Adequate MMI
 - Training and retraining of personnel
 - Simulator based filter
 - Support of personnel in case of extraordinary commands
- Prevention from faulty command output (extra comm.)
 - Multi-phase processing with feed-back and operator's confirmation
 - Multi-channel processing and comparison

Safety of command direction (2)

- Special safety-critical data transmission requirements
- Detection of the failure of the interface between the remote control and the interlocking system
 - Feed-back and comparison
 - Redundant, antivalent output
 - Multi-phase processing with confirmation command

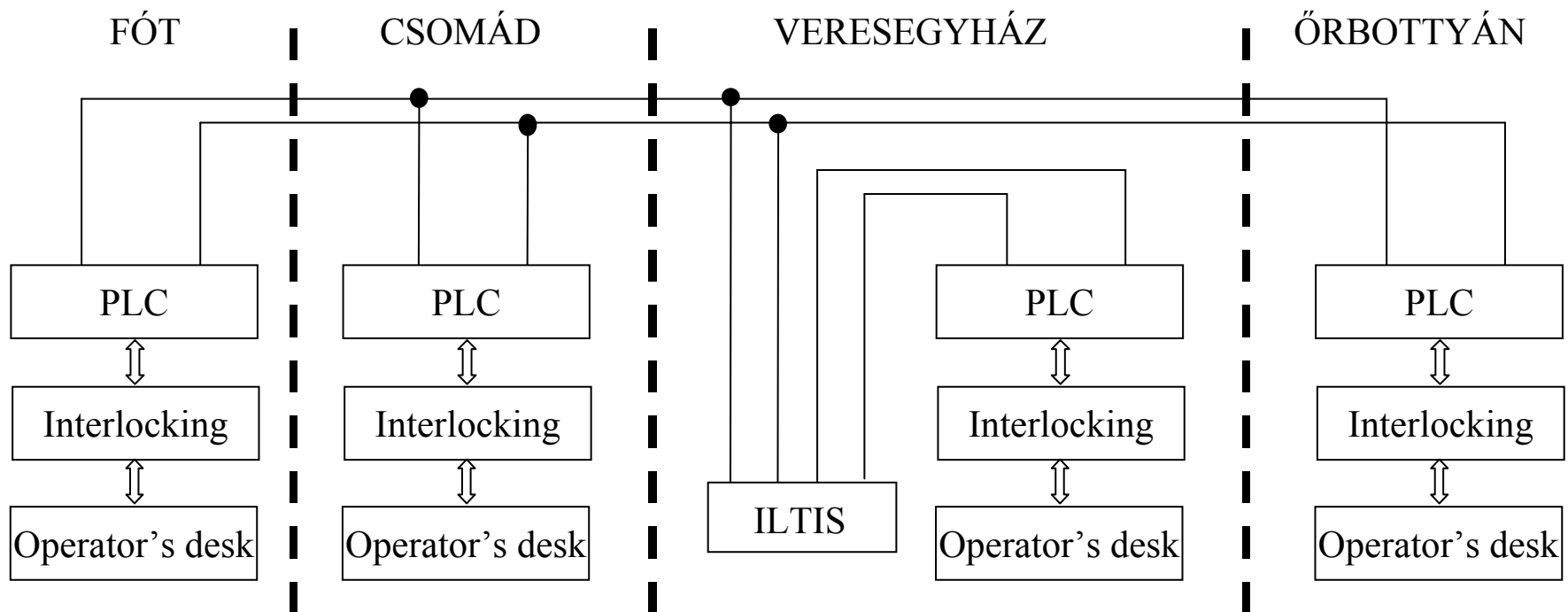
Safety of monitoring direction

- Operator has no chance for a personal survey in case of extraordinary commands
- Leans on the indicated and other (e.g. radio) information
- Indicated information must be safe (safe source, transmission, processing and display)
- Means of safe displaying
 - Two-channel picture changing technique
 - Video memory read-back and comparison

CTC Veresegyház

- Replace of a 30-year-old remote control system
- 4 small stations with simplified interlocking functions
- New, ILTIS control center (Siemens Schweiz AG)
- PLC interfaces on the stations (SIMATIC S7-400)
 - Collecting information from the interlocking system
 - Forward of commands received from the remote control
- Extension of remote commands and indications
- Two-channel output for extraordinary commands

CTC Veresegyház



CTC Veresegyház

Rendszer
Kép
Konfiguráció
Segítség

Kezelési felhívások

Üzemi üzenetek

Zavarok

Rendszer

VG Hálózati üzem

Nincs kapcsolat a bizt. ber-rel
u. Zugriffschutz ausgeschaltet
Tesztadatok
Nincs időjelzés (rádiós óra)
Nyomtatózavar
Nincs minden információs körzet kiválasztása

Csomád

Kép
Opciók
Szövegek
Segítség

C

Főt

Kép
Opciók
Szövegek
Segítség

F

Orbottyán

Kép
Opciók
Szövegek
Segítség

O

Veresegyház

Kép
Opciók
Szövegek
Segítség

Vg