WP8 Control Room AdCoS Use Cases

HOLISTIC HUMAN FACTORS AND SYSTEM DESIGN OF ADAPTIVE COOPERATIVE HUMAN-MACHINE SYSTEMS

Objectives of HoliDes

HoliDes is an ARTEMIS project, co-funded by the European Commission and addresses:

The development and qualification of **Ad**aptive **Co**operative Human-Machine **S**ystems (AdCoS) where many humans and many machines act together, **cooperatively**, in a highly **adaptive** way to guarantee fluent and cooperative task achievement.

Four domains:

- Control Rooms
- Automotive
- Health
- Aeronautics

ECSEL Joint Undertaking
Electronic Components and Systems for European Leadership

Our Aim

The aim of the Airbus Defence and Space Command and Control Room AdCoS is to increase the organisation's performance and security by supporting the operators' effectiveness and efficiency

- Operator physical and mental state assessment
  - Operator absent from or idle at workplace
  - Operator tired at workplace
  - Detection of exploitable behaviour patterns
- User / system supporting load balancing
  - Load balancing at operator level
- Supporting the users
  - Monitor / update employee status

Aims of HoliDes

The project investigates new ways to pro-actively communicate system adaptations to human operators, according to the operators' situation and capacities.

Further aims of HoliDes are:

- To reduce the cost of System Development (in particular compliance with Human Factors and security),
- To reduce needed Development Cycles when applied to innovative and ambitious AdCoS,
- To foster Embedded Systems for AdCoS that are re-usable in different security-critical domains.

Motivation

Make use of novel user interaction technol-ogies like presence detection and eye tracking

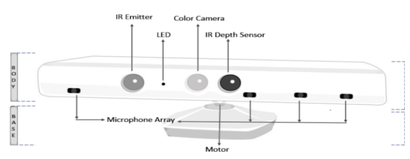
- To **in-creas-e** the **effectiveness** and **security** of control rooms,
- To ensure operator's presence and effectiveness by monitoring the opera-tor's **physical and mental states,**
- To **identify** exploitable operator **behav-ioural patterns** that can jeopardise the security of con-trol room oper-ation,
- To **balance** the individual **workload** by computing the subjective workload on the basis of variables such as
- The oper-ator's **level of expe-rience**
- His/her level of **fatigue** and **stress**
- The **number** and **criti-cal-ity** of items he/she is currently deal-ing with.

Use Case 1 & 2

This part of the AdCoS ensures that operators are present and awake at their stations in case responses are required.

Rationale:
Certain C2 Control Room services such as air traffic control or emergency response services require that operator stations are manned at all times.

Implementation:
IR sensors monitor the presence and movements of the operator at his workplace. In cases of prolonged absence or lack of movement, an actuator (e.g. a vibrating smartwatch) "nudges" the operator to resume his duty. If the operator still doesn't respond, his supervisor is informed.

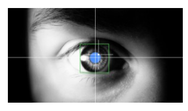


Use Case 3

This part of the AdCoS ensures that operators are alert at their stations in case responses are required.

Rationale:
Tired operators risk missing important clues or acting inappropriately to a situation that requires a quick and specific reaction.

Implementation:
Eye-tracking sensors monitor the mental state of the operator. In cases of indications of fatigue, an actuator "nudges" the operator to take some corrective action such as taking a break.

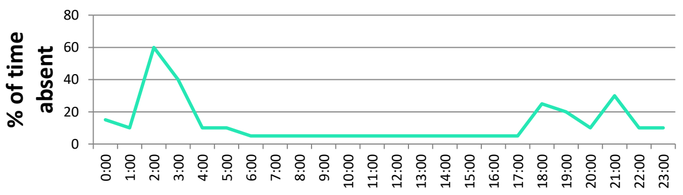


Use Case 4

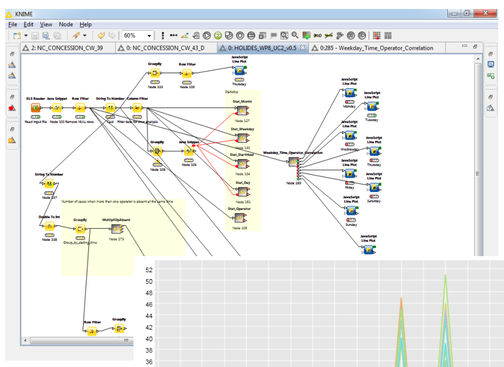
This part of the AdCoS ensures that exploitable operator behaviour patterns are detected.

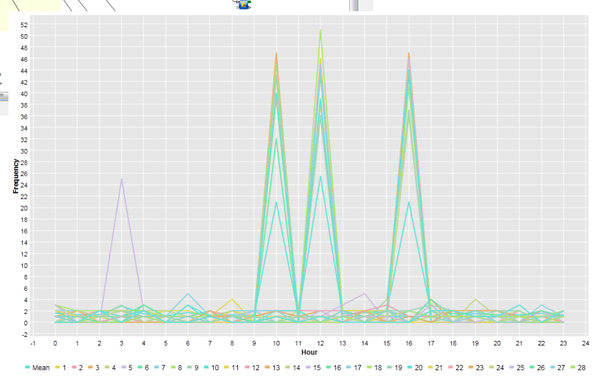
Rationale:
Perpetrators can observe behaviours such as breaks and exploit them for attacks on the C2 control room.

Implementation:
Patterns in operator absences from the workplace (as detected with IR sensors) are logged anonymously and analysed for regular patterns that can be exploited by third parties. The Control Room management can react on those analyses by raising the operators' awareness of the consequences of their behaviour.



Use Case 4



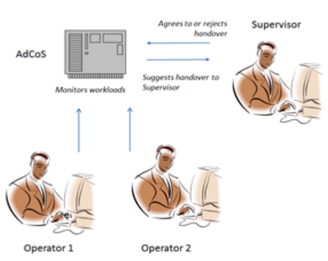


Use Case 5

This part of the AdCoS ensures efficient and effective operation of the C2 Control Room in busy periods.

Rationale:
An individual operator's effectiveness and efficiency can suffer if his workload is too high. If the overall workload of a station is unevenly distributed, individual tasks can be handed over to less busy operators.

Implementation:
A model of subjective and objective workload based on number and criticality of tracks, operator experience and other factors supports an interactive workflow that involves notifying the involved parties of a proposed workload handover and to react on their responses.



Use Case 6

This part of the AdCoS ensures that operators progress and possible next career steps are documented.

Rationale:
The organisation's management may not be aware that individual operators are ready for a next step in their career.

Implementation:
The AdCoS monitors a number of performance parameters of each operator and suggests a change of status (e.g. basic / advanced / expert experience) when all the preconditions are met. Operators can be promoted or otherwise given more responsibility (e.g. job enlargement, job enrichment).

Employee	Status	Time in position	Training levels	Regular instances	Critical instances	Faulty decisions	Performance Assessment
126.12	Basic	5	2	126	14	8 %	Basic
128.36	Basic	18	1	212	6	3 %	Basic
128.42	Advanced	48	3	460	81	4 %	Advanced
129.17	Advanced	46	3	380	76	0,2 %	Expert
129.84	Expert	52	5	590	133	0,2 %	Expert

Consortium

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