Using 3D modelling and AI driven Clustering to Enhance Information Ergonomics in Time-critical Activity

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Decision making depends on accurate real-time information to enable situational awareness. Situational awareness is state when individual has all relevant needed information to know about what is going on when the full scope of the task is considered. It is about what is happening as well as what is the status of factors considered, i.e. the perception of the environment and

comprehension of the elements and their meaning to near future. Taking the perspective of information ergonomics, the quality of information is more important than the quantity, i.e. only critical information is presented as more information causes load in information processing (Franssila et al. 2015). Information related to decision making should be delivered in the form of easily consumed information products in order to avoid distraction to managed process by excess effort on information internalisation. Distraction is easily caused by the information processing lag or additional processing cycles. In information driven operation management setting the key issue is to concentrate on the most relevant information and maintain situational awareness. Adding time as a factor to cause pressure an omnidimensional optimisation problem is present. Optimisation is done according to the completeness of the information, the amount of the information and completeness of processing of the information. Traditional information management process models such as Choo (2002) or Savolainen (2010) the mentioned factors are not discussed per se but optimisation is seen solved implicitly. However, literature on situational awareness brings about the requirements for information, completeness of the information and processing the information as discussed in Chen et al. (2018). According to Franssila et al. (2015) such conditions are significant ergonomic issue. Enhancing information ergonomics promotes performance and lowers stress in work setting (Okkonen et al. 2018).

The presentation is about a construct build on utilising decision orientated methodology (see Kasanen et al. 1993). The presented theoretical construct is validated by external experts iteratively as context and limitations were discussed. The presentation provides a viable solution, i.e. normative approach, by theoretical approach and the results have not passed yet empiric validation. The optimisation problem is grounded on three items. The first one is how to present complete information. The second is about how to limit the amount of information presented. The third is about how much the information is processed on certain moment.

The context of the construct is situational awareness while operating several moving aerial vehicles in mission control. The known information about the vehicles is location, speed and relative position to other vehicles. Traditionally this information is presented in 2D visualisation with symbols and rich numerical information to provide all needed information available. In order to enhance information ergonomics in 3D presentation some numerical information could be reduced as the three dimensions enable presenting relative position as well as location without numerical augmentation and substitute it by simpler visualisation. Clustering adds value to 3D presentation as the algorithm moderates how objects are presented, e.g. highlighted by certain criteria.

In order to enhance information ergonomics 3D presentation is without excess information and in general the notation is simpler and easier to comprehend. This means less objects to follow, less information to process, and more time to concentrate on relevant items. Especially in time critical decision making and operation management situation AI driven organisation and clustering of items draws attention to noteworthy objects and reduces cognitive load. By the lower cognitive load and less items to pay attention to, the operator has better information ergonomic state. The conclusion of the presentation are the design principles for shifting from 2D presentation to 3D presentation as well as how to build setting to operationalise it.

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