Frame based theory: Blending Professional and Digital Behaviours between Nursing and Technology

Abstract

Frame based theory states that real-time decisions are made by comparing past experiences. Frame theory was adapted as a knowledge acquisition theory common in artificial intelligence (AI) literature. The theory enables unmanned vehicles such as the Mars rover to navigate their environment. Informatics nurses encounter an aspect of frame theory within concept maps (ontologies) as they fathom different patient document systems talking the same language across the internet (semantic interoperability) (Leslie, 2008). Apart from using aspects of the theory in semantic interoperability and ontology construction evidence suggests frame theory may be used to describe nursing decision processes. As ontologies are already frame based these similarities may help map correspondences between technology and nursing.

Introduction

Bateson (1955) introduced a term 'frame' to describe the bracketing of information in the human brain for future use and Marvin Minsky (1974) adapted the theory in AI literature. Machine 'cognitive' frames represent knowledge and experience from the past which can be used as a basis to draw conclusions in a current circumstance. There are two types of frames, 'parent frames' hold knowledge and information from past circumstances and 'child' frames which are spawned when a new circumstance is encountered. Child frames inherit knowledge from their parent and add to it from the current circumstance. When some circumstance is encountered the closest parent frame is selected and matched against the circumstance. Every new circumstance is never exactly the same as represented on the parent frame and the parent frame often does not quite fit the current situation. To account for this difference, frame theory proposes that child frames are spawned from the parent frame. Child frames can modify the original parent frame's information by adding new information to suit the present situation and altering the parent frame for its next use.

Body

Aspects of frame theory are used in AI and nursing semantic interoperability literature, the original theory may have correspondences in nursing decision making. The following example modified from English (2006)'s definition may clarify frame based theory in a nursing context. A nurse has every past clinical encounter cognitively represented as knowledge in an array of parent frames. The nurse encounters a new or even a familiar situation. Frame theory states that the nurse will select the closest possible cognitive parent frame to fit the situation. This frame of explicit knowledge is then used to spawn child frames containing current tacit information. The child frame inherits the parent frame's knowledge and may in turn modify the parent with new 'on the spot' information to fit the current situation. English (2006) explains that the parent frame of knowledge represents a stereotypical situation where the nurse (in this instance) can reasonably expect certain things to happen given past experience and existing knowledge. Interestingly, Minsky (1974) suggests the parent frame not only contains past knowledge and experience but also information indicating when to use the frame, such as what can be expected to happen next and what to do if expectations are not met. Frames are subject to re-working as the nurse encounters new experiences. A frame does not define an answer in advance; it is up to the nurse to update the contents of the frame through assimilation of experiences.

Conclusion

The knowledge acquisition frame theory common in AI and semantic web literature has possible correspondences in nursing. These correspondences may mean computer readable frame based ontologies could be used to map nursing decision processes. Future nursing research may infer that frame based theory may provide unifying techniques between nursing and technology.

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