

A Knowledge Acquisition Component for Crisp- and Fuzzy-Controlled Weaning in Intensive Care Units

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Abstract. Objective: The procedure for weaning a patient with respiratory insufficiency from mechanical ventilation may be complex and requires expertise obtained by long clinical practice. Using the expertise for computer-assisted weaning in an adequate manner is a common problem for such applications. The knowledge acquisition component we developed is designed to formalize knowledge in an easier way. This knowledge acquisition tool, which is used for computer-assisted weaning in intensive care units (ICUs), is represented by a so-called knowledge-based editor (KBEdit), which helps intensive professionals to generate crisp- and fuzzy knowledge bases.

Methods: Crisp and fuzzy knowledge bases generated by the editor consist of variables, values, and rules. The variables represent the physiological parameters and the respirator settings. The values are described by way of fuzzy sets and linguistic terms. The editor's liberal user interface design allows adjustment for different ventilation modes.

Results: Our application centers on building knowledge bases for patients which are weaned by the BIPhasic Airway Pressure Ventilation (BIPAP) mode, since the mode allows a very smooth and gradual change from controlled to spontaneous breathing. Based on a huge set of predefined operators, the rules can be formalized with hardly any restrictions. Still, formalizing rules has to be syntax-guided in order to make knowledge bases usable for the expert system. Finally, at the end of forming a knowledge base the editor generates a compiled (scanned and parsed) version of the knowledge base. This executable version of the knowledge base's "source code" is used as an interface for the computer-assisted expert system.

Conclusion: The gained results confirm the applicability of KBEdit to formalize knowledge, making the weaning process transparent and comprehensible. The system is widely approved of by intensive professionals, who spare no effort to tune its applicability. With their assistance and expertise we aim at finding the optimal knowledge base design to improve the weaning process in future.