

Menschliche Zuverlässigkeitsanalyse (HRA) für die Anwendung von Robotersystemen in der Chirurgie

Human Reliability Analysis (HRA) for the Use of Robots in Surgery

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Background

The safety of surgical robotics was investigated before by some authors. A systematic risk analysis of surgical robotics was first given by Laible [Laible04] and our group [Korb04a-c]. So far the reliability of the technical parts (hard- and software) was considered and we pointed out that some risks cannot be appropriately estimated, because they are so called systematic errors. The next logical step is therefore to investigate this points in more detail. This leads us to the method of Human Reliability Analysis (HRA).

Material & Methods

Different methods for the HRA are described in the literature [Reason92, VDI]. In this paper the TESEO Analysis [Bello80] is applied to the surgical robot RobaCKa [Korb04a]. This methods works with five measures for the investigation of the probability of occurrence of different human errors: (a) type of activity, (b) temporary stress factor; (c) operator qualities, (d) activity anxiety factor (e) activity ergonomic factor

Results

An analysis of the different errors, which are possible by the surgeon or the technical assisting personnel is performed.

Discussion

So far it was not systematically investigated how surgeons and technical personnel can influence the security of complex technical systems. This investigation is a first attempt and will be extended in further research.

References

[Reason92] Reason James: Menschliches Versagen. Spektrum Wissenschaftsverlag, 1992

[VDI] VDI 4006 - Blatt2, Menschliche Zuverlässigkeit

[Bello80] GC Bello, V Colombari. The Human Factors in Risk Analysis of Process Plants: The Control Room Model, TESEO. 6th Advances in Reliability Technology Symposium. NCSR-R23, UK, Atomic Energy Authority, Warrington (GB), 1980.

[Korb04a] Korb W, Engel D, Boesecke R, Eggers G, Kotrikova B, Marmulla R, O'Sullivan N, Raczkowski J, Hassfeld S: Chirurgieroboter für Kraniotomien - Risikoanalyse und erster Patientenversuch. at (Automationstechnik) vol 52, no. 6, 2004

[Korb04b] W Korb, D Engel, R. Boesecke, G. Eggers, B. Kotrikova, H. Knoop, R. Marmulla, J. Raczkowski, N. O'Sullivan, H. Wörn, J. Mühling, S. Hassfeld. Safety of surgical robots in clinical trials. In: Proceedings of International Symposium for Medical Robotics, Navigation and Visualization (MRNV2004), Remagen, Germany, 2004.

[Korb04c] W. Korb, R. Boesecke, G. Eggers, B. Kotrikova, R. Marmulla, N. O'Sullivan, S. Hassfeld. Risk Management for the Clinical Investigation of a Surgical Robot. In: McNulty GJ (ed.): Proceedings of the 5th International Conference on Quality, Reliability and Maintenance. (QRM 2004), 1-2. April 2004, Oxford, UK (IMechE, Institution of Mechanical Engineers, UK). Trowbridge, Wiltshire, UK: Cromwell Press, 2004.