Space Subdivision for Indoor Navigation

P5 Reflection

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Analysis of current indoor navigation systems shows that the existing indoor models for navigation lack the indication of special areas with respect to human perception of the environment which results in coarse descriptive location information and inefficient navigation path. Therefore, in this research the conceptual model for determination of functional areas with abstract borders within indoor space was developed in order to improve navigation, localization and guidance services in indoor navigation systems. The proposed model was implemented for two case studies. Two step indoor space subdivision was performed. Firstly, semantic indoor space partitioning was implemented by determining separate functional areas. Secondly, the geometric space subdivision was performed to build the navigation model. The validity of the model was inspected carrying out site observations.

Research was conducted by connecting two different disciplines. Current developments in the geomatics field and studies focused on human behaviour and perception of the environment were investigated. The findings of the research suggest that it has contributed to the existing research on indoor navigation systems by providing empirically supported model for indoor space subdivision. The validation results show that the proposed model can exclude areas that cannot be used for walking. The two step indoor space subdivision employs semantic, topologic and geometric information for accurate navigation services. Complex indoor structure and presence of people within indoor environment are taken into account when deriving the navigation paths. Therefore the research provides basis for the conceptualisation of indoor space for more realistic abstraction of the environment for navigation and localization purposes.

The performed research strongly relates to the MSc Geomatics programme as it covers different aspects of the geomatics field taught in the courses: spatial data capture, storage, analysis and visualisation. In order to implement the proposed model, plans of the buildings had to be

georeferenced and stored in an efficient way for further processing. The implementation of the proposed model was performed applying GIS spatial analysis tools and the visualisation of the spatial data helped to interpret the results. Additionally, the research allowed to develop programing skills and familiarize with specific spatial analysis tools.

The research also contributes to the society. Large public buildings such as airports, stations, shopping malls and other are typically characterised by confusion and disorientation with high probabilities of getting lost for people that are unfamiliar with the environment, thus the navigation system with the indication of separate functional areas and generation of more realistic path might prevent people from getting lost. It is especially important for people with physical or visual disabilities. Furthermore, the findings of the research might also be applied in the spatial design process of large open spaces. The indication of functional areas within indoor space may let to analyse the use of indoor facilities and improve the functionality of the indoor space.