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Serious game intelligent transportation system based on internet of things

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Abstract

This research examines the implementation of the preference ranking organization method for enrichment evaluation (PROMETHEE) approach for multi-criteria decision-making in a character recommendation system for serious games. The method calculates character skill values across multiple criteria and generates rankings of the best characters according to game environment conditions derived from closed-circuit television (CCTV)-based traffic detection. Image processing algorithms were applied to classify congestion levels into quiet, moderate, and busy categories, which directly influence gameplay modes. Experimental results show that PROMETHEE rankings vary across maps (e.g., A6 ranked highest in quiet mode, while B2 dominated in busy mode), demonstrating the system's contextual adaptability. Usability testing with 50 participants yielded an average system usability scale (SUS) score of 78.9, while expert evaluation using game design factor

questionnaire (GDFQ) produced a mean of 4.19/5, both indicating high acceptance and positive user experience. These findings confirm that PROMETHEE is effective in generating context-aware recommendations, providing both strategic depth and engagement. The study concludes that integrating traffic data into serious game design can enrich intelligent transportation systems (ITS) education and awareness, with future improvements possible through real-time player feedback adaptation and machine learning-based traffic prediction. © This is an open access article under the CC BY-SA license. <https://creativecommons.org/licenses/by-sa/4.0/>

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Closed-circuit television; Intelligent transportation system; PROMETHEE; Serious game; System usability scale

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