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Research Article

OBJECTS RECOGNITION AND POSE CALCULATION SYSTEM FOR MOBILE AUGMENTED REALITY USING NATURAL FEATURES

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ABSTRACT
This study presents a system for real world objects recognition and camera pose estimation from natural features in mobile augmented reality. The system recognizes real world objects in real-time directly without any marker and desktop server. The system extracts natural features by using optimized "Speed up Robust Features" SURF algorithm for mobile architecture. The features are further used by pose estimation algorithm for tracking. This system will provide instant information to smart phone user about real world objects like historical places and products. The experiments show that the formulated algorithms provide stable and accurate registration, robust recognition, and tracking of real world objects from natural features in a speedy, easy, and convenient way on iPhone 4S mobile phon.

Key Words: Mobile Augmented Reality, Natural Features, Objects Recognition, Pose Estimation, Vision-Based Tracking, Mixed Reality and Human Computer Interaction

INTRODUCTION
Mobile Augmented Reality (MAR) presents a powerful user interface (UI) to context-aware computing environments. Mobile augmented reality integrates mobile generated information into a person's physical environment so that people would perceive information that would remain existed in surroundings. Mobile augmented reality systems (MARS) can provide augmentation without the use of any extra equipment. Ideally, these systems would work virtually anywhere and add an accurately registered layer of information to any environment whenever desired. By doing so, these hold the potential to revolutionize the way in which information is presented to people. Therefore, the world would become a user interface (Schmalstieg & Reitmayr, 2007).
Further, most of the tracking based augmented reality tool kits include AR Toolkit, (Hirokazu Kato, 2000) AR toolkit Plus, (Wagner & Schmalstieg, 2007) FLAR Tool Kit, (Saqoosha, 2009) SLAR Toolkit, (Schulte, 2010) and Nyar toolkit, (Nyatla, 2011) are based on markers. The camera in these toolkits cannot see reality but would recognize markers that are not part of reality at all. According to the definition of augmented reality, the augmentation is conventionally in real-time and in semantic context with environmental elements (Gianluigi, 2010). The AR browsers don't have any tracking systems. Hence, they cannot track real world objects. This is also mentioned by Rose et al., (2011) and W3C POI WG (W3C, 2011). JISC observatory UK has published a classification of the state of the art AR browsers in Tech Watch Report (Butchart, 2011). This report provides the proof that these approaches do not have tracking systems and can't support marker-less tracking.
Most of the mobile AR systems use a desktop server through internet, but these systems are inversely affected by the network latency like Google Goggles (Google, 2010). Recent examples include Adhikari et al., (2012b) and Adhikari et al., (2012c). Similarly, the virtual guide system also uses a server for video analysis (Adhikari et al., 2012a). There is another category of marker-less mobile AR systems which doesnot uses smart phone.However, the system is using PC and many extra hardware as(Haruhisa Kato & Kato, 2011) and (Waechter et al., 2010). A survey was done by Carmigniani about the current state-of-the-art of technology, systems, and applications in augmented reality (Carmigniani et al., 2011). In Section 3.3 of this survey titled as "Tracking technology for mobile AR systems", the researchers has concluded that
Most of the mobile AR systems are indoor systems having no dynamic environment.
Most of the outdoor markers less systems are using sensors data for tracking and registration.
Marker-less mobile AR suggests a world where people can interact with information directly without requiring the use of any intermediate device.