Project-Proposal
CS365
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Using Object and Text recognition for augmented reality applications

Objective

To be able to recognize and characterize a set of objects and their relative Spatial orientation from a live video stream and use them as markers to render relavent graphical elements into the output display in real time. Also to consider the lighting conditions in the scene for modeling and adding appropriate lighting elements in added Graphics.

Introduction to Augmented Reality

Augmented Reality is exactly what it sounds. One takes input from the “Real World” using any sensor system and modifies it according to his/her needs and use the output of this process for percieving the outside world. Here the perception of the “Reality” is augmented, contrary to Virtual Reality where one tries to create all of the “Reality” that one percieves. Augmented Reality system takes input from the user and the environment of the user, and passes the ouput to the user, who is isolated from certain direct contact with his/her environment. Augmentation of the “Reality” has great prospects for applications like embedding information in the percieved reality, and interfacing with the Digital system more efficiently.

Sensor System and theory and visual coding using tags :

The most important consideration in an Augmented reality system is to shrink the gap between the “Real” and “Illusion”. For this project we are working in the visual domain which is a huge topic. We will take a live video stream from a camera, and in the scene itself we will have recognizable objects and texts, whose pose will change as the camera or the object changes its pose. The task is to analyze the objects in the scene, and calculate their orientation, for the purpose of rendering graphics element in the scene acordingly.

Basically we want to render 3D graphics in the ouput display, for which we need to know the exact pose of the camera in its environment. For that we will analyse the images to get the projection matrix which will transform the camera from its current pose to some specified pose in the coordinate system, in which the rendering will occur.
Previous Work:

Dr. Hirokazu Kato and his team, has developed an opensource library for General Augmented reality application. ARToolkit was written in C++ but its JAVA/Python and even flash port are available under the GPL licence. The library has functions for capturing video stream and grabbing images from the video and then calculating the projection matrix from a bitmap pattern in the scene. They have used OpenGL for rendering graphical element in the output display.


Their has been a number of application potential with this technology, including fields like medical imaging, industrial repairing and as travel guiding system, wikitude, which incorporates image processing from onboard camera, GPS locator, accelerometer and wifi facilities available in many smart phones and renders graphical elements on the screen along with the video. But all of these technology are still in their infancy.

Project Approach:

Our approach in the project will be to first use the conventional techniques for AR application, using Tags and Marker images which is already known to the system, for rapid detection. And then use techniques like Character recognition and face recognition to be used as markers.

We will be building on top of ARToolkit and OpenGL and will use OpenCV also.

The end result we are expecting is to make a Knowledge-based Augmented reality system which is able to recognize a number of objects in its environment, and modifies the scene output according to the need of the user.

References:

2. L. B. Rosenberg. The Use of Virtual Fixtures As Perceptual Overlays to Enhance Operator Performance in Remote Environments, USAF Armstrong Laboratory, Wright-Patterson AFB OH, 1992.
5. Ramesh Raskar, Spatially Augmented Reality, First International Workshop on Augmented Reality, Sept 1998
6. David Drascic of the University of Toronto is a developer of ARGOS: A Display System for Augmenting Reality. David also has a number of AR related papers on line, accessible from his home page.