

## VOXAR LABS – RESEARCH LAB DESCRIPTION

Voxar Labs is a research group that develops and transfers technology related to visualization, tracking and interaction techniques focusing on augmented reality in multi-disciplinary application domains. The laboratory is located at the Informatics Center (CIn) building, at the Recife campus of the Federal University of Pernambuco (UFPE). The group has many ongoing projects, including international cooperations, industry projects, and also research and academic ones.

Since 2005, a group of researchers with common interests has been investigating virtual reality and augmented reality technologies at CIn, leading to the creation of Voxar Labs. This team, headed by Professor Veronica Teichrieb, is composed by multi-disciplinary researchers, from professors to PhD, master and undergraduate students, nowadays numbering more than forty. They work in diverse knowledge domains like computer science, computer engineering and design, as well as application driven areas like education and physiotherapy.

Developing people by augmenting experiences is what the Voxar Labs team does, being the laboratory's mission. The values representing the core priorities in its culture are creativity, cooperation, reliability, responsibility, flexibility, and enjoyment. Detailed information about the Voxar Labs can be found at <http://www.cin.ufpe.br/~voxarlabs>.

## Research Areas

Voxar Labs performs research on three major subjects, which are visualization, tracking and interaction, focusing on augmented reality. The laboratory team has been involved with augmented reality research for almost thirteen years.

### Visualization

Ideally, augmented reality proposes that the user must not be able to distinguish between real and virtual information, demanding that the virtual elements show both geometric (correct placement, correct size, occlusions identification) and photometric (shadowing, mutual reflections, chromatic adaptation to scene illumination) consistency. To accomplish this task, Voxar Labs works with great efforts in real time computer graphics algorithms [1] for massive data visualization and photorealistic rendering. Other projects regarding this subject aim to build tools for 3D reconstruction from images and for aiding the hydrodynamics design of submerged ships advancing and maneuvering with physics simulation [2] in collaboration with the Brazilian Navy.

### Tracking

The problem related to correctly positioning virtual information relative to the real environment is solved by tracking the environment so that the synthetic elements can be adequately registered with the real scene. There are diverse tracking technologies available and the optical tracking is often used due to its cost, accuracy and robustness. Two types of optical tracking can be cited: marker based and markerless. Markerless augmented reality has received more attention from researchers in the latest years and presents important challenges to be overcome. Examples of works with markerless tracking inside the laboratory are: two methods based on depth-assisted rectification, which transform features extracted from the color image to a canonical view using depth data in order to obtain a representation invariant to rotation, scale and perspective distortions [3]; and a technique that incrementally detects and tracks primitives using the generating process of point clouds of visual SLAM systems [4].

### Natural Interaction

Natural interaction is a powerful tool to achieve intuitiveness and usability for human-computer interfaces. In fact, interfaces are constantly evolving to provide users an easier way to interact with machines. In this field, Voxar Labs is conducting research focused on natural interactions applied in diverse application domains. One of them is physiotherapy, with an environment for rehabilitation and accessibility purposes based on augmented reality techniques using Microsoft Kinect [5]. The group also researches gesture recognition for natural interaction [6].

## REFERENCES

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