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AN iMINDS ICON RESEARCH PROJECT | PROJECT RESULTS

MEDIA

GIPA

Laying the foundation for a generic, state-of-the-art augmented reality (AR) platform

Augmented reality (AR) holds great potential. It augments views of a physical, real-world environment with computer-generated input such as sound, video or graphics. Imagine for instance that your glasses project – upon your request, and right in front of your eyes – more info on a nice car that drives by...

Yet, the large-scale deployment of that type of apps is still a long way off. Today's AR technology first has to overcome some limitations, such as the absence of a generic platform that enables the rapid and easy creation of AR applications across industry sectors.

"The GIPA project rallied a number of partners who wanted to explore the opportunities of augmented reality to enhance and expand their product portfolios," says Filip Hautekeete (Neopica), GIPA's project lead. "Engineering company Grontmij and entertainment / game development studios Neopica and Visual Impact had obviously come across AR technology already – but important limitations were preventing them from building it into their products."

"Hence we set out on a journey to investigate AR technology updates that could help the consortium partners make progress in this domain," adds prof. dr. Peter Schelkens (iMinds - VUB), the project's research lead. "Our research ran along various tracks. For instance, instead of using cumbersome visual markers (such as stickers), we wanted to explore the potential of object recognition to directly deploy augmented reality components on top of video feeds. The use of 3D inputs was a second challenge, and another point of attention was our generic approach – creating technology for partners across a variety of industries."

THE OUTCOMES

1. A novel approach that builds on 3D inputs for the creation of higher-quality AR apps

Today, AR applications primarily make use of 2D input. Yet, 3D camera and scanning technology is advancing rapidly. The GIPA consortium wanted to anticipate that move towards 3D, and developed unique algorithms that leverage 3D inputs for the creation of higher-quality AR apps.

One major GIPA achievement in this regard has been the introduction of a novel approach to quickly acquire and process scenes of large-scale environments by means of LiDAR scanners, and translate those scenes into detailed 3D reconstructions. The GIPA approach can perform 3D registration of point clouds in any scene without any assumption on the type of scene or sensor set-up. Compared to other systems, it does not require any semantics of the environment, but implicitly incorporates this information by analyzing the underlying surface (i.e. flat, spherical, cylindrical, etc.). The system runs at approximately 10 frames per second, which is faster than most existing approaches.

Along the way, the team tackled a number of related sensor synchronization issues too (related to position and inclination measurements, for instance).

2. A demonstrator that reveals how augmented reality will impact our lives in the years to come

All components of the GIPA research (including the progress that has been made in terms of 3D object recognition) have been combined in a demonstrator that

leverages augmented reality to instruct a random person how a PC's video card can be replaced. The AR app guides you through the various procedures, indicating for instance where exactly you have to put your screwdriver. Uniquely, an interactive component has been built in as well, allowing you to get in touch with a remote expert in case you would have a question or problem.

3. An instrument to measure Quality of Experience (QoE) of AR systems

GIPA resulted in the development of a tool that can be used to measure Quality of Experience (QoE) of augmented reality systems; an instrument that is context & device agnostic, and that can be used with non-experts in controlled experiments.

4. Lack of hardware is a showstopper, but GIPA learnings provide partners with longer-term head start

"At the start of the GIPA project, Google had just introduced its Google Glass. Hence, we thought that big advances in the domain of augmented reality glasses were just going to be a matter of time," says Filip Hautekeete. "In the meantime, though, we know that Google Glass has not been a big success – and we are still waiting for the arrival of hardware that allows us to display AR-enriched content in a nice and user-friendly way. No doubt, that has been an important showstopper for us."

"On the other hand, the fact that we have been able to investigate AR's potential before the commercial introduction of AR glasses, means that we now have a major competitive advantage. GIPA has provided us with the technology and insights we require to start developing commercial AR products as soon the proper hardware does become available."

NEXT STEPS

"Looking back at the project, we have learnt a lot and have made remarkable progress," says Filip Hautekeete. "However, our demonstrator also shows that more work remains to be done before any commercialization can be considered."

One example includes object recognition: for the time being, the GIPA demonstrator only recognizes a limited number of PCs. But as its algorithms continue to learn, the team is confident that this is only a temporary limitation. In terms of guaranteeing real-time mobile throughput as well, some progress needs to be made – but again, this is not a fundamental issue that cannot be overcome. And as mentioned already, the GIPA consortium awaits the arrival of the right hardware to display the AR overlays. Currently, the demonstrator is PC-based, but the team's ultimately objective is obviously to display information on the new generations of augmented reality glasses.

Based on the GIPA project, a new research project – ARIA – has already been initiated. That should be the final step to bridging the last technological gaps and enable the project partners to come up with solutions that are ready for commercialization.

FACTS

NAME	**GIPA**
OBJECTIVE	Laying the foundation for a generic, state-of-the-art Augmented Reality (AR) platform
TYPE	ICON project
DURATION	01/01/2014 – 31/12/2015
PROJECT LEAD	Filip Hautekeete, Neopica
RESEARCH LEAD	prof. dr. Peter Schelkens, iMinds - ETRO - VUB
BUDGET	2,030,000 euro
PROJECT PARTNERS	Barco, Grontmij, Neopica, Visual Impact
IMINDS RESEARCH GROUPS	ETRO - VUB, IPI - UGent, MICT - UGent, MMLab - UGent

WHAT IS AN
ICON PROJECT?

iMinds is the digital research center and business incubator for Flanders, Belgium. Its ICON research projects are agile and demand-driven, combining academia and industry partners. ICON projects typically have a duration of two years, yet quickly adapt to the rapidly-evolving digital landscape. ICON partners intend to use the project results in their products or services.

GIPA project partners:

The GIPA project was co-funded by iMinds, with project support from Agentschap Innoveren & Ondernemen.