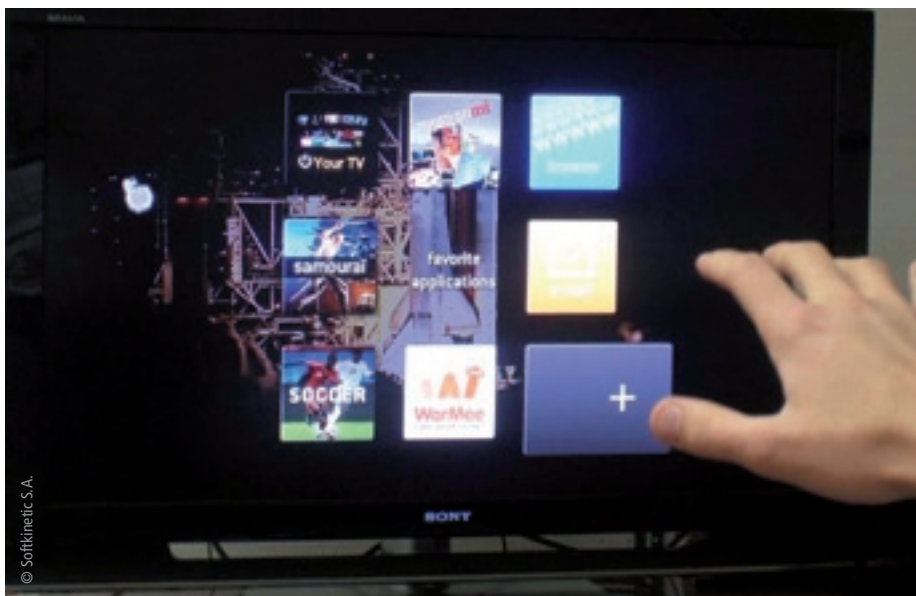


Minority Report

Futuristic Interface Technologies by 3D Vision

Remember the great scenes in the movie when Tom Cruise like a magician manipulated data and documents over a huge transparent screen by nothing more but moving his hands? PMD technology based on time-of-flight with the Photonic Mixer Device (PMD) enables exactly that by efficient and inexpensive 3D image capture at high speed. In the last years, the technology has made enormous progress.



When developing new camera and sensor systems, the creator of the technology, PMDTechnologies, cooperates with outstanding experts in their respective markets as well as experienced partners and camera manufacturers. This results in measuring systems that are perfectly tailored for the customer's needs in terms of accuracy, resolution, cost and robustness.

PMD cameras use the time of flight principle. Every camera is equipped with at least one light source which illuminates the scene. Typically, infrared light is used; invisible to the human eye. Alternatively, other (visible) light sources are possible and, depending on the application, sensible. The distance measurement is done by measuring the time that the emitted light takes to travel from the light source to the object and back to the PMD receiver inside the camera. If this time of flight is known, it is very easy to calculate the distance using the known

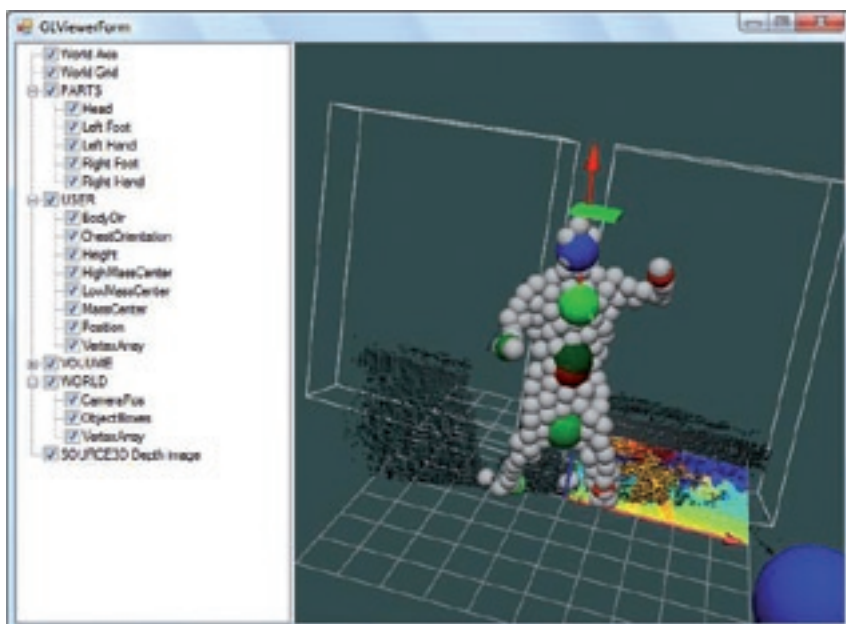
and constant speed of light. A significant advantage of PMD technology is the ability to not only capture both the entire scene in 3D and in a traditional grayscale image at the same time, but to also deliver the signal strength for each pixel. With the signal strength it is easy to determine the quality of the measurement for every distance value. The pixel integrated SBI circuit (SBI – Suppression of Background Illumination) of state of the art PMD sensors achieves an outdoor capability that creates reliable results even on sunny days. A more detailed description of the PMD principle was published in INSPECT 1/2008.

The PMD[vision] CamCube: Distance measurement with more than 41,000 pixels

World Record Resolution in a Modular Design

Currently, there are several PMD cameras available for a diverse range of application areas. The latest model is the PMD[vision] CamCube, an evaluation platform, which is – with its modular concept – designed for highest flexibility. With its high resolution and its functional diversity it is suitable for a wide range of applications. The PMD chip inside the CamCube is based on the cutting edge of PMD technology and contains more than 41,000 ToF pixels (204 x 204) – more than any other time of flight 3D camera on the market. With the integrated SBI circuit, this camera also has a high resistance to background light. The USB 2.0 interface provides frame rates of up to 25 frames per second. The standard PMD[vision] CamCube model has an unambiguous range of 7.5 m. This range can be significantly extended through appropriate measures. A fundamental advantage for the evaluation of PMD technology is the modularity of the CamCube. It is easy to change the CS-mount lens and therefore adapt the field of view and light intensity to the customer's needs. Secondly, the light sources, which are contained in separate housings, can be replaced. Through customized light sources it is possible to extend the range and accuracy of the camera, reduce the power consumption or heat dissipation or mount the light sources in a different location than the camera module. The latter is, for example, needed in the automotive sector, where the light sources are usually mounted in the head lights, whereas the camera module is placed behind the windshield above the rear view mirror. This unique diversity is also especially





Body recognition with Softkinetic's iisu (picture courtesy Softkinetic S.A.)

useful for industrial applications. Its flexibility makes the PMD[vision] CamCube suitable for a wide range of applications. For example:

- robot control,
- bin picking,
- virtual and augmented reality applications,
- area inspection,
- man machine interaction (see below).

Small Gestures with a High Impact

An interesting application for the PMD[vision] CamCube comes from the Belgian company Softkinetic S.A. Softkinetic develops and markets software for gesture recognition and body pose estimation for end-user applications. Softkinetic's iisu ("Interface Is You") serves as a middleware between 3D cameras and application software and is able to capture the human body and recognize the position and orientation of the head, the body, the arms and legs. This makes it possible to control applications only through your own movements – without the need for additional input devices like a keyboard or a mouse. For the games industry, this is the consistent continuation of established input methods like Sony's Eye-Toy or Nintendo's Wii and provides the player with a new quality of immersion into the game world. The player does not indirectly control an avatar anymore but becomes an active part of the virtual world himself. He can observe this world, move around in it and interact with objects like he does in the real world.

But also other sectors benefit from this technology. The health sector can use the body capturing in rehabilitation exercises. The fitness industry also has the potential for interesting applications. The ability to recognize gestures can replace or augment the often unclear and complicated remote controls for TV sets and other consumer electronics devices and provide much more extensive and intuitive functions. In many areas of industrial applications, those interactive man-machine capabilities might also be very interesting in the future, delivering innovative solutions.

The PMD[vision] CamCube is – with its currently unequalled resolution and performance – ideally suited for iisu. Its high resolution achieves the precision that is required for exact gesture and body recognition. PMDTec and Softkinetic make it possible for software and hardware manufacturers to create innovative and intuitive user interfaces.

In the future, even more technological progress is expected. In terms of resolution, dynamics, speed, background light resistance and accuracy, a lot will happen in the coming years. Exciting things to look out for.

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