

# Toon Van den Zegel

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Web: <http://tvdz.be>

Nationality: Belgian

## Profile

Computer Vision Engineer specialized in time-of-flight depth cameras with Machine Learning, Game Physics and Computer Graphics expertise.

## Employment History

### Computer Vision Engineer

SoftKinetic, A Sony Group Company, Brussels, Belgium

August 2012 – Present

- 3D Reconstruction for an eyewear company:
  - o A main contributor for the development of a 3D reconstruction application. Techniques such as dense visual odometry, sparse icp, color marker detection, marching cubes and truncated signed distance fields were used. Implemented several techniques such as volumetric graph-cut and structure from motion methods to refine the 3D reconstructed result.
- Design of algorithms to improve time-of-flight depth camera image quality.
- Close Interaction Library (DepthSense CILib): (<https://www.softkinetic.com/Products/CILib>)
  - o Hand tracking and gesture recognition library with close range depth cameras, licensed to Intel and embedded in the first version of their Perceptual Computing SDK. Since renamed to Intel RealSense SDK. CILib is now a product on its own.
  - o Fine-tuned and improved the close interaction library algorithms to reach customer acceptance criteria.
  - o Designed and implemented gesture detection, hand tracking and pose estimation with random forests classifiers and regressors.
  - o Implemented hand tracking based on a custom rigid body dynamics solver.
- Hand tracking in Virtual Reality with time-of-flight depth cameras. (<https://www.youtube.com/watch?v=R53IEQq02wg>)
  - o Contributed to the hand detection, interaction and tracking algorithms.
- Human Tracking Library (DepthSense HTLib) (<https://www.softkinetic.com/Products/HTLib>)
  - o Full human body skeleton tracking with long range depth cameras, embedded into Sony Playstation 4 SDK and powering, among other titles, Ubisoft Just Dance 2014 and 2015 on PS4.
  - o Responsible for improving the skeleton expectation-maximization framework.
- Developed several 3D Computer Vision prototypes such as surface interaction.

### Software Developer

ArKaos S.A., Brussels, Belgium

March 2010 – August 2012

- MediaMaster & GrandVJ
  - o Professional real-time video mixing software: C++, Direct3D 9 (Windows), OpenGL (Mac OSX), wxWidgets
  - o Designed and developed the cross-platform graphics engine for MediaMaster, Video Mapper and Grand VJ: C++, Direct3D 9 Ex (Windows), OpenGL (Windows & Mac OSX), Qt.
  - o Used for concerts, festivals, clubs, tv shows, ... such as The Voice Belgium, Big Brother Australia 2015, Australia's Got Talent 2011, DJ Tiesto - The Kaleidoscope World Tour, ...  
More showcases at <http://www.arkaospro.net> or <https://www.facebook.com/arkaos>.
- Customer Support

## Technical Skills

<b>Machine Learning:</b>	Random Forests Classification and Regression, Gradient Boosting, SVM, Kernel Logistic Classifiers, Neural Networks, Expectation-Maximization
<b>Image Processing:</b>	Anisotropic Diffusion, Domain Transform, Bilateral Grid/Permutohedral Lattice, Non-Local Means, Guided Filter, Depth Upsampling Techniques (Fast Bilateral Solver, JBU, NAFDU, ...), Shape from Shading
<b>Simulation:</b>	Rigid Body Dynamics, Inverse Kinematics, Verlet Integration, Sequential Impulse Solver
<b>Graphics Programming:</b>	OpenGL Core, Direct3D 11, Dual Quaternion Skinning, Deferred Rendering, Real-Time Local Reflections
<b>Computational Geometry:</b>	Sparse ICP, Articulated ICP, Implicit Surfaces, Marching Cubes, Shape Manipulation
<b>Optimization:</b>	Gauss-Seidel, Relaxation, Conjugate Gradient, Gauss-Newton, Levenberg-Marquardt
<b>Code Optimization:</b>	SIMD, DirectCompute, OpenCL, Parallelization, Thread-safe programming, Real-time performance,
<b>Time-of-Flight:</b>	Low-level Time-of-Flight (multipath, scattering, ...), Calibration, Color Depth Registration
<b>Tools &amp; Libraries:</b>	C++, Qt, wxWidgets, Jenkins, Jira, Agile/Scrum, 3ds Max, OpenCV, Eigen

## Portfolio

- Implementation of "Barron, Jonathan T., et al. "Fast bilateral-space stereo for synthetic defocus." *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2015." (<http://tvdz.be/2017/03/fast-bilateral-space-stereo/>)
- Implementation of "Böhme, Martin, et al. "Shading constraint improves accuracy of time-of-flight measurements." *Computer vision and image understanding* 114.12 (2010): 1329-1335." (<http://tvdz.be/2015/06/improving-tof-with-shading/>)

More projects: <http://tvdz.be> or <https://github.com/tvandenzegel>

## Education

**Master of Artificial Intelligence (Cum Laude)**

2008 – 2009

University of Leuven, Belgium

**Master in Industrial Sciences: Electronics – ICT (Magna cum laude)**

2003 – 2008

Thomas More, Belgium

## Theses

**Master Thesis Master of Artificial Intelligence**

2009

Phoneme Recognition with Kernel-Based Classifiers: Towards an Automatic Speech Recognition System.

**Master Thesis Master in Industrial Sciences – ICT**

2008

Development of an industrial image analysis program in Visual C++ 2005 for 2D SSRM measurements.

*Received NV Philips Innovative Applications 2008 award*