

# Computer Models For Fire and Smoke

<i>Model Name:</i>	PTV Viswalk
<i>Version:</i>	6.0-11
<i>Date:</i>	February 10 <sup>th</sup> 2014
<i>Model Actively Supported?:</i>	yes
<i>Classification:</i>	Egress; Microscopic, Agent-based; Social Force
<i>Very Short Description:</i>	PTV Viswalk is PTV Group's pedestrian simulation software.
<i>Modeler(s), Organization(s):</i>	<b>Organization:</b> PTV Group. <b>Implementation independent modelling</b> (at any time): Social Force Model: Prof. Dr. Dirk Helbing, Dr. Anders Johansson, Dr. Pradyumn Shukla; Extensions: Stefan Hengst (connection of storeys), Lukas Kautzsch (dynamic potential), Dr. Tobias Kretz (dynamic potential) <b>Current technical contributors to software manufacturing:</b> Sven Beller, Lukas Kautzsch, Dr. Tobias Kretz, Dr. Axel Leonhardt, Brett Little, Dr. Klaus Nökel (product management); Peter Ehrhardt, Thomas Eppinger, Simon Friedberger, Andree Große, Stefan Hengst, Jakob Keller, Cornelia Liepert, Krista Nylander, Andrej Pohlmann, Sebastian Reichelt, Dr. Normen Rochau, Stephan Seifermann, Florian Sutter, Dr. Matthias Vigelius, Dr. Steffen Weckeck (software development); Anya Dommer, Felix Kühner, Helmut Namyslo (quality management)
<i>User's Guide:</i>	available, delivered and installed with setup (also with freely available demo version: <a href="http://vision-traffic.ptvgroup.com/en-us/products/ptv-vissim/trial-version/">http://vision-traffic.ptvgroup.com/en-us/products/ptv-vissim/trial-version/</a> )
<i>Technical References:</i>	Johansson, A., Helbing, D., and Shukla, P., Specification of the Social Force Pedestrian Model by Evolutionary Adjustment to Video Tracking Data, Advances in Complex Systems 10 (2007) pp.271-288.

T. Kretz, A. Große, S. Hengst, L. Kautzsch, A. Pohlmann, and P. Vortisch, "Quickest Paths in Simulations of Pedestrians", in *Advances in Complex Systems* 14(5) pp. 733-759 (2011).

T. Kretz "The Effect of Integrating Travel Time", in *Pedestrian and Evacuation Dynamics 2012*, U. Weidmann, U. Kirsch, and M. Schreckenberg (eds.), Springer-Verlag (2014).

T. Kretz, G. Mayer, and A. Mühlberger, "Behavior and Perception-based Pedestrian Evacuation Simulation", in *Pedestrian and Evacuation Dynamics*, R.D. Peacock, E.D. Kuligowski, and J.D. Averill (eds.), pp. 827-831, Springer US (2011).

See also validation references below and

<http://scholar.google.de/scholar?q=%22Viswalk%22>

*Validation References:*

T. Kretz, S. Hengst, and P. Vortisch, "Pedestrian Flow at Bottlenecks - Validation and Calibration of VISSIM's Social Force Model of Pedestrian Traffic and its Empirical Foundations", in *International Symposium of Transport Simulation 2008 (ISTS08)*, M. Sarvi, ed., Monash University, Melbourne, Australia (2008).

PTV Viswalk has passed the tests of the RIMEA guideline .

<http://www.rimea.de/>

RIMEA guideline: U. Brunner, H. Kirchberger, C. Lebeda, M. Oswald, R. Könnecke, M. Kraft, A. Thoss, L. Mülli, A. Seyfried, G. Spennes, C. Hartnack, S. Wader, M.A. Braun, R. Tilly, T. Kretz, and S. Thumser, "Richtlinie für Mikroskopische Entfluchtungsanalysen 2.2.1" RIMEA e.V. (2009)

T. Kretz, S. Hengst, V. Roca, A. Pérez Arias, S. Friedberger, and U.D. Hanebeck "Calibrating Dynamic Pedestrian Route Choice with an Extended Range Telepresence System", in *2011 IEEE International Conference on Computer Vision Workshops, First IEEE Workshop on Modeling, Simulation and Visual Analysis of Large Crowds*, November 2011, Barcelona, Spain pp. 166-172, IEEE (2011).

J. Bamberger, A.-L. Geßler, P. Heitzelmann, S. Korn, J. Kahlmeyer, X.H. Lu, Q.H. Sang, Z.J. Wang, G.Z. Yuan, M. Gauß, and T. Kretz "Crowd Research at School: Crossing Flows", to appear in *Traffic and Granular Flow '13*, M. Boltes, M. Chraïbi, A. Schadschneider, A. Seyfried (eds.), Springer-Verlag <http://arxiv.org/abs/1401.2038>

<i>Availability:</i>	Commercial; permanent license with or without customer service contract including support and updates with annual fees.
<i>Price:</i>	1.000 – 20.000 €, depending on license size
<i>Necessary Hardware:</i>	32 Bit version: minimum of 2 GB RAM 64 Bit version: minimum of 4 GB RAM for 3D display: graphics card supporting at least OpenGL 2.0 Windows Vista, Windows 7, Windows 8, Windows 8.1 recommended system: 64 Bit, 12 GB RAM, intel core i7 CPU
<i>Computer Language:</i>	C++
<i>Size:</i>	0.5 – 2.0 GB depending on license size
<i>Contact Information:</i>	info@vision-traffic.ptvgroup.com +49 721 9651 7280 Haid-und-Neu-Str. 15 D-76131 Karlsruhe Germany For representatives in other countries see <a href="http://www.ptvgroup.com/">http://www.ptvgroup.com/</a>

*Detailed Description:*

PTV Viswalk is PTV group's pedestrian simulation software. It is a single software environment for building, simulating and analyzing models of pedestrian infrastructure.

PTV Viswalk allows fast and flexible modeling in a modern user interface embedded in a software constructed according to the latest software architecture principles. Available are CAD import, or creating the model on DWG, DXF, JPG, PNG, BMP and other backgrounds. It is even possible to show OpenStreetMap (mapnik or cycle map) or Bing Maps (aerial) as background.

During building and simulation it is possible anytime to switch to a 3D view. Elements which are placed above each other are then shown above each other. On the contrary it is also possible to use multiple network windows to display different storeys next to each other.

The basic simulation model is the Social Force Model. To be precise: it is a combination of the circular specification and the circular specification II as discussed in (Johansson, Helbing, and Shukla 2007). This has been extended by the so called dynamic potential which optionally sets for each pedestrian the current direction of expected earliest arrival at the destination as direction of the desired velocity instead of the direction of the shortest path as it is done in traditional models of pedestrian

dynamics (Kretz, Große, Hengst, Kautzsch, Pohlmann, Vortisch 2011), (Kretz 2014). All model parameters are accessible for the user to allow a versatile usage.

Simulation speed obviously depends on CPU and GPU abilities and the model complexity. With an off-the-shelf PC from 2013 real time speed with up to 20,000 pedestrians is possible and experimental simulations with 5,000,000 pedestrians were carried out.

Data output includes for example level of service (“heat”) maps, measurement of density, speed, walking time, delay time orientation and other parameters on arbitrary areas, measurement of walking times between arbitrary start and end points. All results are shown within the software and can be exported. Averages, min, max, and standard deviation for various simulation runs are also calculated automatically and displayed in the same results list. Videos can be recorded during the simulation. With storyboards in one simulation run arbitrarily many videos can be created from different perspectives.

PTV Group offers services to utilize an extension of the model where smoke data is read into the simulation and emergency exit signs can be placed and occupants react accordingly to both (Kretz, Mayer, Mühlberger 2011).

Further information can be found

- Via Google Scholar: [http://scholar.google.com/scholar?q="Viswalk"](http://scholar.google.com/scholar?q=)
- Via Youtube: <http://www.youtube.com/playlist?list=PL2ED0957B3313B031>
- On the manufacturer’s website: <http://vision-traffic.ptvgroup.com/en-us/products/ptv-viswalk/>
- At the RiMEA website: <http://www.rimea.de/de/rimea-projekt/analysen-testfaelle/viswalk/>

