DIGITAL BROCHURE
INCONTROL STADIUM CROWD SIMULATION SOLUTIONS

INCONTROL
Simulation Solutions

STADIUM CROWD SIMULATION

Certify your stadium by designing your crowd flows with state of the art simulation software

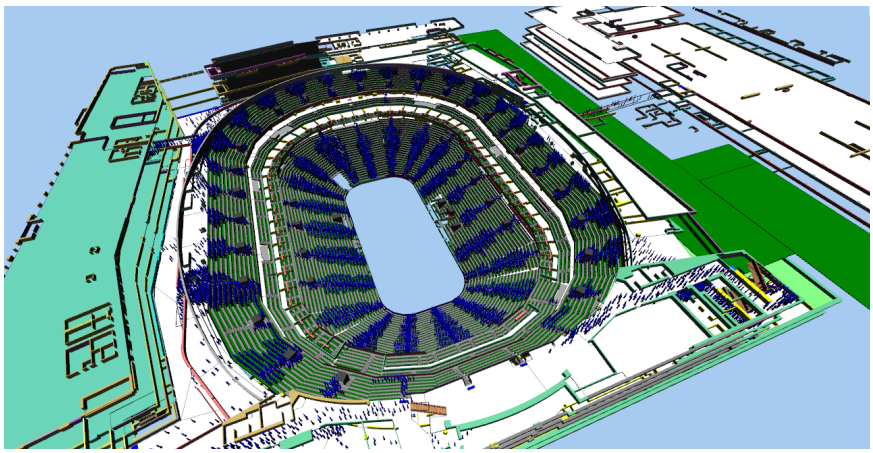
Using Pedestrian Dynamics® crowd simulation software enables you to:

- Adapt and improve your design by testing different options in various stages
- Evaluate different "what–if" scenarios
- Analyse the compliance with (inter)national guidelines and requirements
- Work with a model that can be used from the design– to the operational phase of the stadium
- Effectively report and present your designs to the authorities and other stakeholders

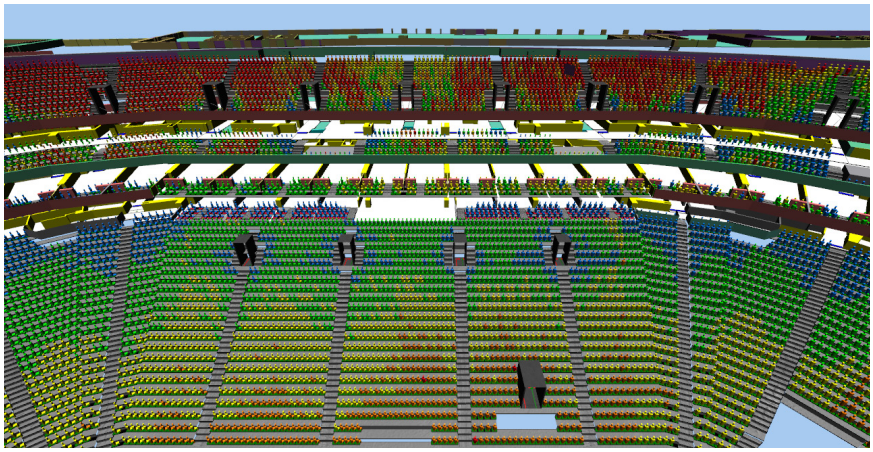
DESIGNERS, OWNERS & OPERATORS

As a designer, owner or operator you are completely aware of the challenges that you are facing during the design, construction and operation of a stadium. The continuous balancing of safety, spectator experience and commercialisation of your venue is a complex process. Furthermore the venue needs to comply with the requirements from licensing authorities, councils and sports associations.

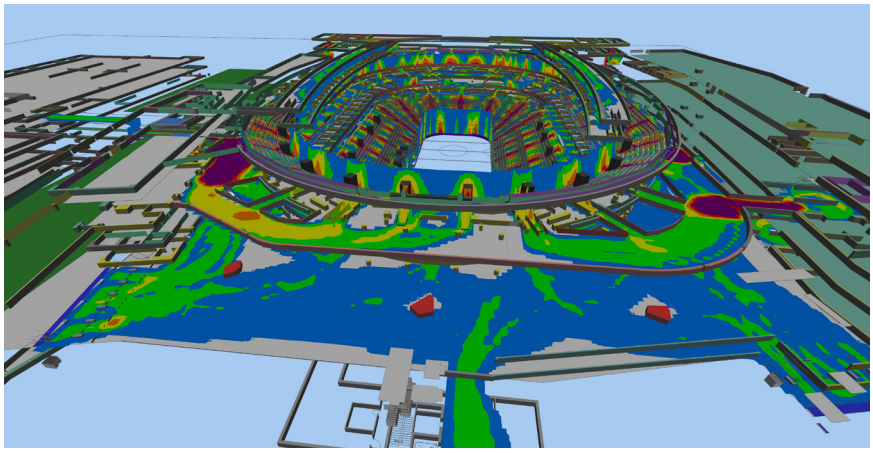
Our crowd modelling software Pedestrian Dynamics® enables you to develop a virtual 3D model of the stadium and analyze the crowd flows of any "what–if" scenario you can think of, from normal game day operations to emergency scenarios. Our academic crowd algorithms realistically simulates each spectator, from the "last mile" perimeter to their seat and to a place of reasonable safety in 8 minutes. Quantitative reporting helps you in assessing you stadium performance and benchmarking different options.



Full 3D crowd flow visualization



Visualise evacuation time to place of reasonable safety



Measure crowdedness with density maps

RETURN ON INVESTMENT

The investment will repay itself by:

- Optimization of the design of commercial areas and outlets and so increase potential turnover
- Delivering the foundation to have visitors in a place of reasonable safety within 8 minutes
- Identifcation of design improvements early in the design process. Making changes in the drawing is cheaper than changes in the construction
- Grown into an efficient organization in which all the stakeholders work with the dynamic model in a coordinated process with consensus

EXPERIENCE

We have more than 15 years of experience in providing crowd simulation solutions to various domains. More than 25 stadiums worldwide successfully implemented our solutions, some examples:

- New Zenit Arena, St. Petersburg (RU)
- Singapore Sports Hub, Singapore
- Little Caesars Arena, Detroit (USA)
- Arena do Gremio, Porto Alegre (BR)

TECHNOLOGY

For appliance with stadium designs, Pedestrian Dynamics® offers unique features:

- the ability to model the whole stadium in one integrated model that connects all floors and surrounding facilities
- the ability to quickly simulate large amounts of spectators (± 100.000)
- specific modelling objects like tribunes stands, vomitories and turnstiles

OUR OFFER

INCONTROL offers software licensing, product training, modelling services , technical support, business development, sales support and partnerships.

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STADIUM REFERENCES

INCONTROL has worldwide experience in providing software and services for the stadium design and – operations market. Below you will find a selection.

FACTS & FIGURES

- Offices in the Netherlands, Germany, USA, Japan & China
- More then 25 years of simulation experience
- Owner of crowd simulation software Pedestrian Dynamics®
- Experience with more then 25 stadium projects world wide.

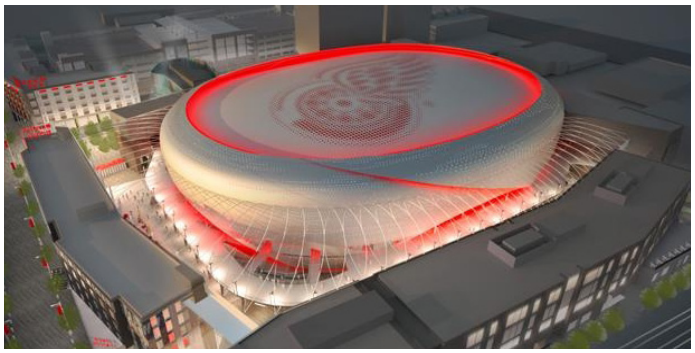
INCONTROL OFFERS

- Software & licensing
- Training
- Technical support
- Modelling & development services
- Business development & sales support
- Partnerships

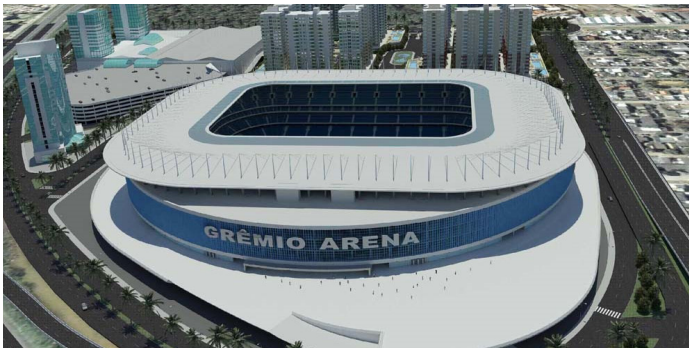
New Zenit Arena
68.000 seats
st. Petersburg
Russia

Singapore Sports Hub
55.000 seats
Singapore

Metalist Stadium | 40.000 seats | Kharkiv | Ukraine



Little Caesars Arena | 20.000 seats | Detroit | USA

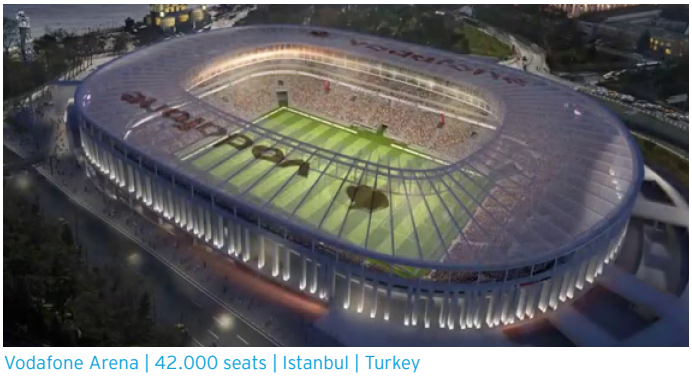


Arena do Gremio | 55.000 seats | Porto Alegre | Brazil

LaVell Edwards Stadium| 66.000 seats | Provo | USA

De Kuip | 51.000 seats | Rotterdam | The Netherlands

NSK Olimpiejsky | 70.000 seats | Kiev | Ukraine



Vodafone Arena | 42.000 seats | Istanbul | Turkey

Phlips Stadium | 35.000 seats | Eindhoven | The Netherlands

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BENEFITS OF SIMULATION FOR THE SOCCER STADIUM OF PSV EINDHOVEN

INDUSTRY
Crowd Simulation

APPLICATION AREA
Stadiums & Arenas

COUNTRY
The Netherlands

CHALLENGE
PSV Eindhoven requested INCONTROL to develop a customized simulation tool. With this tool PSV itself is able to create and analyze different scenarios.

SOLUTION
With the use of graphical user interfaces (GUI) INCONTROL made the tool a user–friendly device that can be used by non–simulation experts. The user can apply and save his/her own settings, and hereby create different models for different situations.

RESULT
Crowd simulation offers PSV the possibility to deal with all challenges concerning crowd management and efficient usage of the soccer stadium.

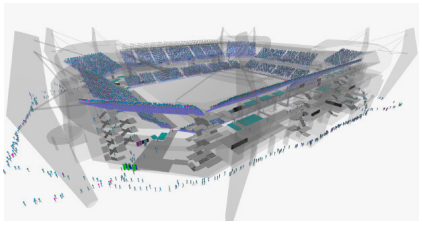
PSV has become Dutch Soccer League Champion for 6 times in the last 10 years. They used Pedestrian Dynamics to ensure the safety of their 35.000 supporters.

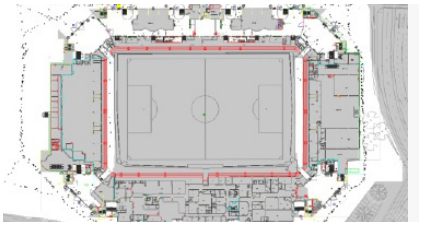
PSV STADIUM

One could say that PSV Eindhoven is currently one of the most successful soccer teams in the Netherlands. Their soccer stadium has a capacity of 35,000 seats, located in an upper and a lower ring. Every soccer game PSV seeks the optimization of the pedestrian flows by managing the different activities that people undergo during their stay. These activities include for example, ticket sale, security check–in and the sale of food and beverages. Next to this, PSV wants to create insight into evacuation scenarios. Since doing an evacuation drill with 35,000 people is quite a complex matter, PSV is always searching for other methods that can help them in analyzing different evacuation solutions. The last years the stadium is also used for other purposes like pop concerts. The infrastructure was initially not created for these other commercial purposes. Therefore PSV also seeks for optimization of the pedestrian flows during these events.

GOAL

PSV Eindhoven requested INCONTROL to develop a customized simulation tool. With this tool PSV itself is able to create and analyze different scenarios. The tool is developed in two phases. The first phase contained the development of the soccer game scenario. And afterwards, in the second phase, also the event scenario is created. With the use of graphical user interfaces (GUI) INCONTROL made the tool a user–friendly device that can be used by non–simulation experts. The user can apply and save his/her own settings, and hereby create different models for different situations. The user does his/her experiments, after which the result is displayed in excel–sheets. Next to an overall view of the pedestrian flow through the different layers and activities of the stadium also quantitative output is created in order to do a proper analysis of the designed situation.





THE MODEL

Pedestrian Dynamics is designed for the simulation of large amounts of pedestrians in various environments and contains targeted user–friendly simulation objects such as turnstiles, toilets, bars, coin sale machines and emergency exits. Each of these objects has parameters, which can be set to create a realistic situation. A 2D and 3D visualization is available to create a realistic representation.
The tool's infrastructure is built in different layers, which can be turned off individually to enable the different layers and sections of the stadium to be analyzed on a detailed level.
With the use of entrances, exits and passages the different sections and areas in the stadium are connected. A pedestrian will create a realistic route through the possible connections to reach his destination. Within a soccer stadium the destination is set to be the tribune area which is assigned to the pedestrian (based on ticket sale). Based on the settings concerning toilet usage, coin sale and food and beverage, the pedestrian will adapt his route to use any of the assigned activities.
In the model it is possible to analyze the effects of different arrival intensities of the visitors; the amount of pedestrians; tribune destination and arrival times of the visitors.

EVACUATION

The user can create a total evacuation on a pre–defined moment during the simulation run. Visitors will adapt their behavior, for example increase their walking speed. Also the visitors will individually choose an evacuation route based on the available emergency exits and passages. By closing or opening passages and exits during an evacuation the user is able to create its own "What if" situation. By analyzing the model visualization and quantitative output, the user can define and resolve bottlenecks. In this way current and proposed evacuation plans can be validated.

EVENTS

Since the stadium was initially not designed for other commercial events than the soccer games, temporary infrastructure is used to optimize the pedestrian flows during these events, for example female toilets, bars and ticket checkpoints. In this event scenario the field is also used to accommodate the visitors (± 14,000) during the event. Due to this different use of the infrastructure and the facilities of the soccer stadium there was decided to develop a second scenario focused on events. This scenario is created based on the design of a major event in 2011. The entire temporary infrastructure is developed in such a way that the capacity of these facilities is adapted in the simulation tool. By doing so, well thought–out decisions, concerning the temporary infrastructure, can be made during the design–phase.

FINALLY

Crowd simulation offers PSV the possibility to deal with all challenges concerning crowd management and efficient usage of the soccer stadium. This concerns challenges during soccer matches and other commercial usage of the stadium. In the future, every important decision that is made is supported by the simulation tool.

ARENA PORTO ALEGRENSE

INDUSTRY
Crowd Simulation

APPLICATION AREA
Stadiums & Arenas

COUNTRY
Brazil

CHALLENGE
Ensuring the compliance with the Green Guide

SOLUTION
INCONTROL developed a crowd simulation model with support of Amsterdam Arena International and performed scenario analysis

RESULT
With the results OAS Arenas could make absolute validated decisions regarding crowd management. The compliance with the Green Guide was validated.

"The simulation model offers us a tool to test drive operational solutions and to optimize these before going to live trials" Carel Breen, Amsterdam Arena International

FIFA REQUIREMENTS

The growing recognition and importance of simulation modelling to shape crowd management decisions during sports venue design and construction was recently illustrated on the Arena Porto Alegrense stadium in Brazil.

INCONTROL was brought in by the stadium developers OAS Arenas to develop a simulation model of the stadium to help ensure compliance with rigorous safety regulations and standards, including complying with FIFA's World Cup 2014 standards as described by their Safety & Security Guide ("Green Guide"). During the project INCONTROL was supported by Amsterdam Arena International

INCONTROL's model allowed them to perform different crowd scenarios analysis and compile vital reports of the scenarios for the stadium which was earmarked for a capacity of 60,000 visitors.

"Besides investigating in– and outflow schemes we are able to improve the logistics around F&B outlets and merchandise stands, improving the revenue generating options in the stadium and on the large concourse outside the stadium"

Carel Breen, Director Amsterdam Arena International

OBJECTIVE

The objective of the project was to identify potential problem areas, propose recommended mitigations and or operational solutions and measure the design against FIFA Green Guide regulations.

Two scenarios were performed and analyzed according to the given performance indicators:

Scenario 1: Emergency evacuation of spectators from the stadium. The given performance indicators for this scenario were: evacuation times, maximum densities of pedestrian areas, duration of visitor immobility due to high densities in pedestrian areas and gate capacity performance.

Scenario 2: Spectators entering the stadium and arena under normal conditions. For the ingress flow, the city transport operation was taken into account to define the ingress arrival rates. The performance indicators were: visitor journey times, visitor queuing times at gates and determine appropriate queue lengths.

Based on the CAD drawings supplied by OAS Arenas, INCONTROL were able to develop a simulation model which included all layers (floors) of the stadium. Based on these drawings all relevant walking spaces and entities (e.g. tribune stands, doors, stairs, turnstiles, security areas) were defined. Even elevators and escalators were included and all entities had variable process parameters.

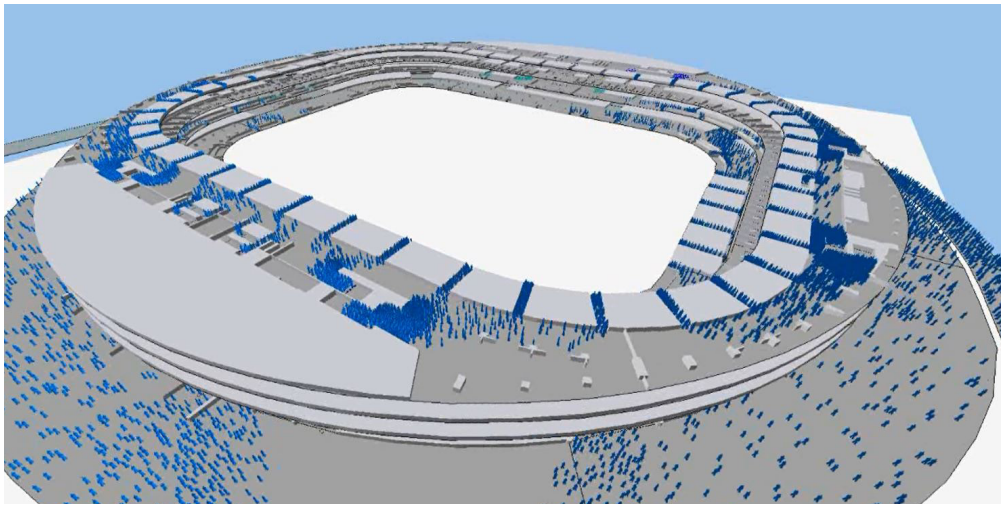
RESULTS

By monitoring both the walking areas and the visitors, output was created to perform the analysis of the scenario.

The following output was created by the model:

– Densities of the areas measured in persons/m2 (also over time)
– Durations of visitor immobility due to high densities
– Travel time of the visitors (between pre–defined locations)
– Evacuation time (per tribune stand/ exit)
– Waiting times (per turnstile/process)
– Time to empty or fill a certain area (e.g. stands)
– Capacity of gates (per gates)

With the results OAS Arenas could make absolute validated decisions regarding crowd management. Due to the clear 2D and 3D visualization of the scenarios in combination with a structured and validated report, all stakeholders were convinced that the solution provided was the optimum way forward to progress with the project plans.



LITTLE CAESARS ARENA

Little Caesars arena

"The simulation software was an intricate part of our Safety Act Certification preparation and application"

Richard Fenton, CSSP, Vice President, Corporate Security and Safety, Ilitch Holdings Inc.

Domain
Crowd Simulation

Application Area
Stadium & Arenas

Country
The United States of America

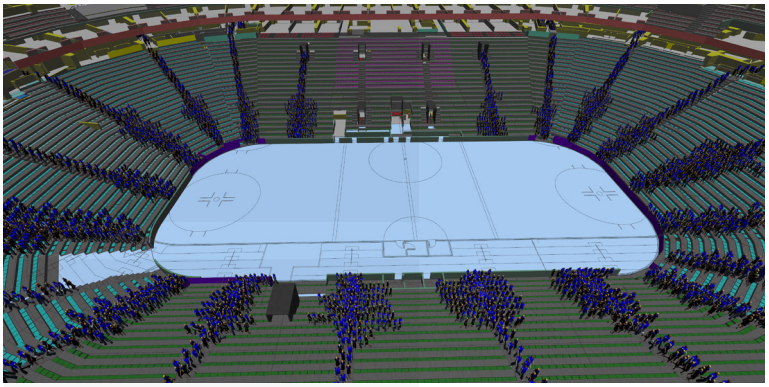
Goal
Realise a safe and secure crowd management in arena and the surrounding congested neighbourhood

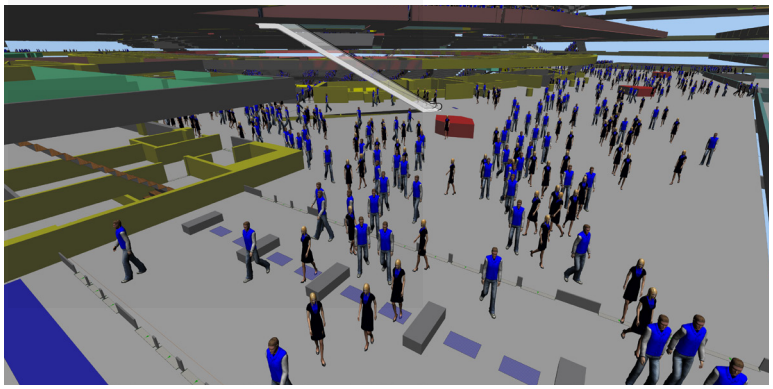
Facts & figures
- Multi-use eight-story indoor arena
- The ice surface 40 feet (12 m) below street level
- Projected seating capacity of 20.000
- 60,000 m2 of sports and entertainment district in and around downtown Detroit

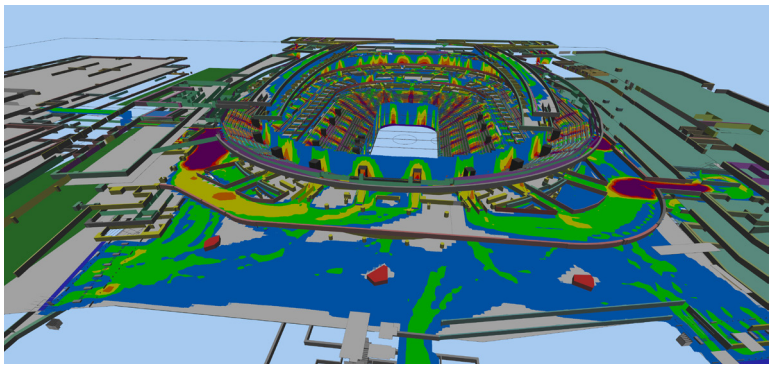
DETROIT RED WINGS
Detroit Red Wings new facility – Little Caesars Arena leverages INCONTROL's simulation software for safe & secure crowd management in arena and surrounding congested neighbourhood.

For the multiple type events that will occur at the Little Caesars Arena and the adjoining neighbourhood, the safety & security team will be in a better position to anticipate, plan, train, communicate and deploy staff, to effectively and efficiently manage a safe environment for attendees, participants and staff.

"For the multiple types of events that will occur at the Little Caesars Arena and the adjoining neighbourhood, District Detroit, the safety and security team will be in an enhanced position to anticipate, plan, train, communicate and deploy staff to effectively and efficiently manage a safe environment for attendees, participants and staff." Said Richard Fenton, CSSP, Vice President, Corporate Security and Safety, Ilitch Holdings Inc. Fenton further stated that, "the INCONTROL's simulation software was an intricate part of our Safety Act Certification preparation and application, by demonstrating our ability to develop effective safety/security plans."







PLANNING

The solution assists the planning team in developing and validating event and emergency plans, resulting in the identification of gaps in resources and training.
Little Caesars Arena is able to simulate unlimited functional scenarios such as ingress, egress, crowd flow, evacuation, and sheltering to experiment and explore various response options.

TRAINING & EXERCISE

By using the simulator it helps the venue safety & security team, as well as their public safety partners to define appropriate roles and responsibilities, allowing them to customize training plans and sharing venue–specific needs with event staff and stakeholders. The solution runs the "What–IF" scenarios that can be encountered during any event and is intended to serve as a road map for them to continually make improvements. Finally, it allows them to visualize the response to plans, and helps the team SEE how to implement those plans.

OPERATIONS

The INCONTROL simulation software addresses operational needs such as estimating queue times and crowd flows, identifying resource requirements, maximizing the effectiveness of signage and asset positioning, as well as optimizing commercial areas and retail locations within a venue or event. By addressing these needs, operations and processes can be both tested and validated. Any data inputs can be presented on a visual representation of the Little Caesars Arena.

"Simulation allows us to visualize the risks and threats of crowd management and the designed procedures for all staff and first responders making it an exceptional tool for preparation, training and evaluation."

Johnny Jackson, Director, Corporate Security & Safety, Detroit Red Wings, Inc.

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PEDESTRIAN DYNAMICS®

Pedestrian Dynamics® crowd simulation software is the ultimate tool to model, analyse, optimize and visualize pedestrian crowds in any infrastructure.

APPLICATION AREAS

Pedestrian Dynamics® is applicable in a wide scale of domains:

- Stadiums & Arenas
- Museums & Exhibitions
- Events
- Theme Parks
- Shopping Malls
- Cities
- Airports
- Railway Stations
- Passenger ships

Pedestrian Dynamics® Crowd Simulation Software

INTRODUCTION

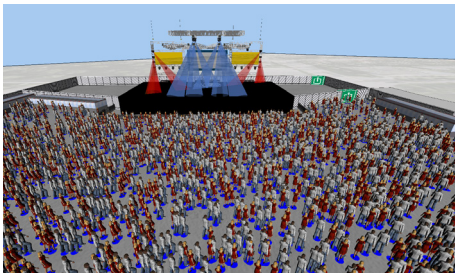
Pedestrian Dynamics® is an extensive and user friendly crowd simulation software application. It is designed for the creation and execution of large crowd simulation models in complex infrastructures. It can be used to evaluate the performance and safety of your environment in every phase of the life cycle; from design to operations.

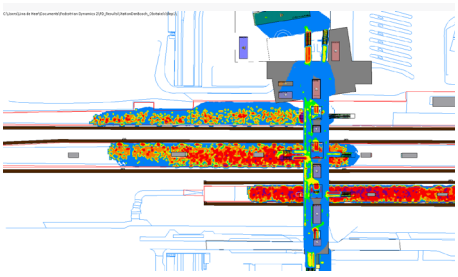
Pedestrian Dynamics®:

- Offers a rapid model building environment which saves time and costs. Only a few steps are required to model most complex operations.
- Is flexible, robust and easy to use.
- Has been used widely used in many large scale projects in most critical infrastructure environments including stadiums, airports, public transport terminals, mega events and urban planning.

Contact us for more detailed information or a demonstration of Pedestrian Dynamics®.

- www.pedestrian-dynamics.com
- www.twitter.com/pedestriandynam
- siminfo@incontrolsim.com





With Pedestrian Dynamics® you can easily simulate large crowds and determine the density within the infrastructure.

BENEFITS

Pedestrian Dynamics® crowd simulation software has a proven track record to analyze and optimze large crowd flows. Crowd simulation enables you to:

Decrease costs: by optimizing the infrastructure during the design phase, high additional costs can be avoided during the operations.
Regulation compliance: help evaluate and address regulatory compliance with local and international safety mandates and norms.
Predict & anticipate: the model enables you to predict the crowd flows and anticipate.
Analyze the risk: analyze the risk and the safety of people and infrastructures in every phase of the life–cycle; from design to operation.
Optimize Evacuation: Develop, test and optimize evacuation and data–driven response plans.
Answer "What If": Quickly compare alternative designs and scenarios on–the–fly.
Improve commerce: Increase customer satisfaction by improving pedestrian flows, experiences and comfort and identify the commercial attractiveness of locations by flow measurements.
Present & convince: Effectively communicate with all stakeholders in the decision making process.
Operate efficiently: Optimize and increase operational efficiency within the given environment and with available resources.

KEY FEATURES

Pedestrian Dynamics® offers:

- Import of industry standards (CAD/CAD 2015, XML, CityGML and many more)
- Integrated 2D&3D models
- Fast simulation runs
- Simulation of large realistic crowds up to 100,000
- Explicit Corridor Mapping (ECM)
- Extensive set of model drawing tools
- Unique agent properties
- Domain specific elements
- Easy scenario definition
- Intelligent dynamic routing
- Microscopic and mesoscopic
- Integrated output module with automatic report generation.
- Easy movie playback and recording

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It is our mission to make clients and partners successful by offering the most innovative simulation solutions.

FACTS AND FIGURES

- Offices in The Netherlands (HQ), Germany, United States of America, Japan and China.
- Offers a worldwide partner network in more than 20 countries.
- 25 years of experience in developing simulation software.
- Successfully implemented more than 5.000 solutions worldwide.

INCONTROL SIMULATION SOLUTIONS
INCONTROL Simulation Solutions is the leading manufacturer of simulation software with over 20 years of experience. Our product portfolio contains Enterprise Dynamics®, Pedestrian Dynamics®, ShowFlow® and EDX®. Each product is developed for a specific market and tailored to the users. Key markets include:

- Logistics
- Manufacturing
- Airports
- Harbors
- Rail & Public Transport
- Crowd Safety & Infrastructure

MISSION
Our mission is to make our clients and partners successful in their field of application by offering the most innovative simulation solutions. Clients use our simulation software to simulate large scale logistic systems and infrastructures such as baggage handling systems, container terminals, train stations, assembly lines and football stadiums. Our simulation software enables the user to cope with time, costs, resources, reliability, safety and sustainability.

Solutions are implemented at leading companies worldwide. Our intensive educational efforts have led to a successful use of our simulation software at universities, schools and institutes all over the world.

Our offices are located in The Netherlands, Germany, the United States of America and China. Via these offices and a worldwide partner network we provide software, implementation, product training and a 24hr support to our products.

SOFTWARE

INCONTROL is the owner of various simulation software packages. This software is implemented and distributed by our own offices and our worldwide partner network. Each package has a strong simulation platform with an open architecture. The platform is used in combination with a library of user–friendly objects.

The software can be offered to the clients as:

- Platform; the client uses the platform to develop their own simulation applications and to develop their own library of objects.
- Platform and library of objects; the client uses the existing library of objects to develop a simulation model of their business operations.
- End user application; the client receives a simulation application, which is developed for the business operations of the client.

In consultation with the client it is determined which possibility complies to the client's needs for a successful implementation of our simulation software.

SERVICES

Implementation

If the client chooses an end–user application, INCONTROL works together with the client to implement the software. During this project an application is developed based on the client's wishes. INCONTROL has a department consisting of experienced simulation engineers. They will lead the project to a successful implementation.

Training

INCONTROL offers training for all users of our simulation software; starters as well as advanced users. This training can be followed at one of our training centers, located at our offices, or on–site at the customer. In addition to the standard training INCONTROL also offers customized training courses.

Maintenance & Support

As after sales service INCONTROL offers maintenance & support on the software. This includes full technical support, user support and product updates.

To evaluate how our simulation software can make you and your organization successful, please contact us or visit our website.

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