

ENGLISH

**Needed in every auditorium**

**Increases learning success**

**Applicable for various use cases**

**Very reliable – it simply works**

***THE FUTURE OF  
UNIVERSITIES IS HYBRID***

***SALES ARGUMENTATION***

*for system integrators*



The AVard  
2022  
Winner

Products:  
Education

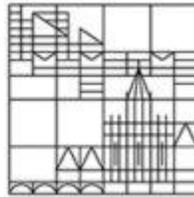
VST TrackingMaster

THE AVARD  
THE AVARD AWARDS COMMITTEE

**Tracking  
Master**  
Automated person tracking

# SOME OF OUR HAPPY CUSTOMERS

Universität  
Konstanz



Universität  
Bremen



Technische  
Hochschule  
**Georg Agricola**



Pädagogische Hochschule Freiburg  
Université des Sciences de l'Éducation · University of Education

Ostfalia  
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angewandte  
Wissenschaften  
– Hochschule  
Braunschweig/  
Wolfenbüttel

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Universität Jena

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## Components of the TrackingMaster

## Further components



### Lidar sensors incl. housing

- Laser class 1, according to DIN EN 60825-1.
- Mounting at a height of 20-30 cm.
- Power supply by POE.
- Detection area: 10 meter radius (overlapping of detection areas, of sensors, necessary).

### TrackingMaster software on NUC (Designed for TM)

- Updateable software.
- Software controls the camera.
- Access via web frontend with various setting options.

#### Interfaces

- External planning and video management systems supported (e.g. OpenCast).
- Media control connection supported.
- All TrackingMaster functions can be controlled via APIs (REST-API).

### PTZ camera: Canon (recommendation)

- Camera control interface: HTTP
- Camera control autonomous: Manual control of PTZ still possible.
- Different manufacturers usable.

### Media control

- Start/stop of the system via media control.
- Existing infrastructure can continue to be used. TM controls the camera, tapping of the stream via existing set-up possible.

## USP OF THE TRACKINGMASTER

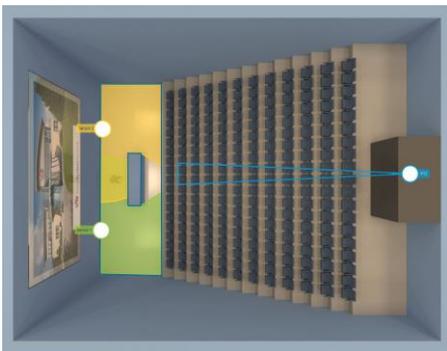
- Trouble-free system can be used without additional personnel.
- System is significantly more accurate than other systems due to laser sensors.
- Preset zones (also in depth) can be defined with values in relation to each other.
- Individually adaptable to requirements, e.g. filming of the periodic table when a professor is standing in front of it.
- Software development and support in German and English.
- Product designed and developed in close coordination with customers.
- Automatic recognition of multiple speakers.
- Easy operation (start-stop with one click), through integration in media control.

**The TrackingMaster is used to automatically track professors in lectures. For this purpose, a PTZ camera is automatically moved based on data from external sensors to keep the professor constantly in the picture.**

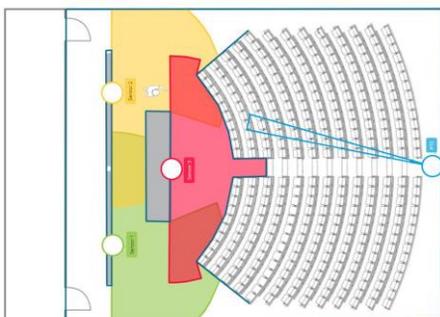
The reliable position detection of the TrackingMaster is based on the use of 2D laser scanners. By mounting the sensors in the blackboard area, the camera movement is not influenced by students in the auditorium, large projections behind the lecturer and a multitude of other interfering influences. Likewise, this enables detection of people looking at the blackboard or not looking directly at the PTZ camera.

The software evaluates the data in real time and filters out the positions relevant for camera tracking. The tracking PC can be operated in a separate room due to the network connection. Based on the recognized positions, the PTZ camera is controlled.

The exact behavior of the system can be coordinated in consultation with the users. Among other things, the behavior of the camera can be determined for the case that no professor is in the detection area.



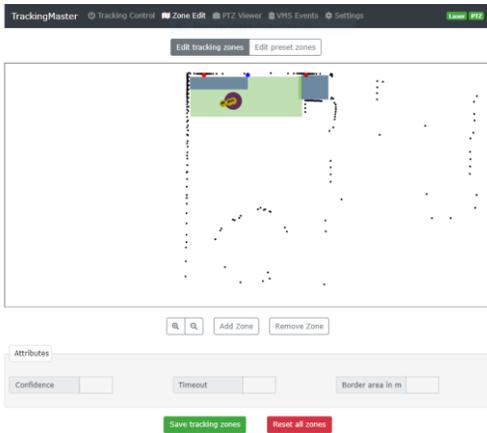
In most lecture halls, two sensors are sufficient to track the entire walking paths.  
Note: The lidar sensor must not be covered. The laser scanning is not visible.



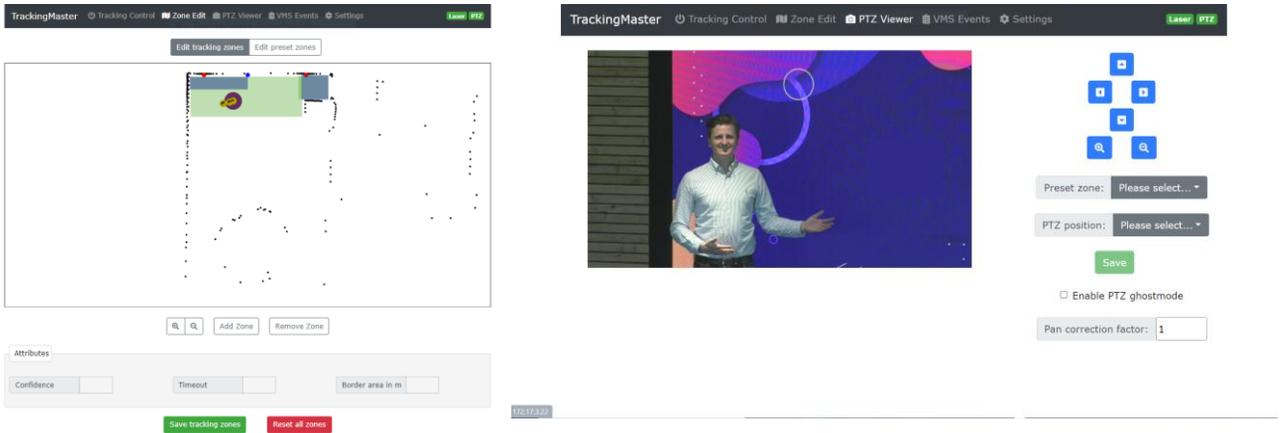
If tracking is also to be done in front of the professor's desk, a third sensor is required.

# IMPLEMENTATION OF CUSTOMIZED REQUIREMENTS POSSIBLE

## Frontend



## View of the camera



## USE CASES (SELECTION)

- The professor behind the professor's desk must always be filmed, regardless of what is happening in the presentation area, e.g. setting up an experiment.
- People walking past the professor's desk to the exit should not be filmed, but the professor walking along should be filmed.
- The periodic table should only be filmed when the professor is standing in front of it.
- In front of the blackboard the professor should be tracked, directly at the blackboard the preset "whole blackboard" should be selected.
- If the professor is standing in front of the left board, the left board preset should be displayed, if the professor is standing in front of the right board, the right board preset should be displayed.

## SETTINGS

### Tracking behavior

All settings take place in an easy-to-use frontend.

### Tracking/ Preset Zones

- New tracking or preset zones can be set individually (Without prior knowledge in the frontend).
- Details can be set.
  - Confidence defines the value compared to other zones.
  - Timeout defines how long the camera waits before it jumps to the next zone (in seconds).
  - Border defines how far the professor must go out of a zone for the new zone to take over.

### Camera setting

- For each preset zone, the exact camera image can be set.
- For each tracking zone, the desired image section can be set.
- Speed of camera tracking adjustable.

### Settings

- New sensors/camera can be set-up in the system via IP and the exact position can be entered.

## OPTICAL SYSTEMS

**Optical systems can be used for simple rooms with constant light and when there are no special requirements for tracking.**

- Optical systems are offered by the respective camera manufacturer, the TrackingMaster is manufacturer-independent.
- Optical systems detect the movement of the lecturer only on one axis. Approaching the blackboard cannot be detected and therefore no camera behaviour (e.g. zooming up) can be triggered, so that the writing is easily readable.
- The TrackingMaster can define the value of zones so that, for example, students walking through the area of the blackboard are not detected if the professor is standing at the desk.
- Optical systems usually work with a quality reduced stream and are therefore more susceptible to interference. The TrackingMaster, on the other hand, works completely independent of lighting conditions or other optical interferences such as striped clothing.
- The TrackingMaster also detects people from behind or from the side. In addition, it is not necessary to teach the software, e.g. by storing a photo of the professor.

## AUDIO-BASED SYSTEMS

**Audio-based systems are primarily intended for rooms in which no movement takes place and the people are sitting at a large table.**

- The TrackingMaster continuously tracks the professor: audio-based systems do not allow tracking, but only the automatic selection of defined camera settings (preset zones).
- Even strong ambient noise does not cause interference with the TrackingMaster.
- On the other hand, the TrackingMaster also works when the professor is not speaking.
- Our laser-based system is much more accurate than audio-based systems (tracking to centimeter accuracy) and can therefore enable smooth camera movements.
- If more than one person is on stage, the TrackingMaster recognizes this and adjusts the camera position so that both people are in the picture.

## UNIVERSITIES

- Reliable positioning of the professor, so that the professor and, if necessary, the blackboard are displayed in full screen, **thus optimizing university didactics in the context of hybrid teaching.**
- **High reliability of the system:** No additional personnel required for operation or monitoring of the tracking.
- **Individual setting options**, e.g. through config frontend and depth detection for different requirements (e.g. fixed presets at the blackboard area when professor is standing in front of the blackboard or definition of higher level tracking zones, e.g. to ignore students leaving the room when professor is recorded in front of the blackboard)
- Complete **workflow** from recording to filing (solution-independent, e.g. OpenCast) **can be automated** and flexibly designed. We provide the relevant interface and the required code for the common solutions.
- Small unit (besides the laser sensors, only a small supplied computer unit is needed – included in the system already), which can be integrated in the lecture hall or in the server room.
- **Regular security and function updates available.** With a development team in Germany, we can react promptly to requirements from the market.
- The system works independently of the camera manufacturer.

## SYSTEMHÄUSER

- **Positioning as a pioneer of hybrid teaching.**
- **Attractive margin for system integrators → Please contact Tim Kutter for the current price list.**
- First-class support and continuous further development of the system: **contact & support in German and English.**
- System individually configurable to customer requirements and special circumstances.
- Training of your team and well documented **installation guide** available.
- **Partner concept available**, with benefits such as joint promotions, product demos, showroom equipment and attractive conditions.
- TrackingMaster is **DSGVO compliant.**
- **Further details can be found on the website [www.trackingmaster.io](http://www.trackingmaster.io)**

## SITUATION AT THE UNIVERSITIES

- Lecture halls are too small for some lectures e.g. Math 1 Basics (almost every engineering course). There is a need of streaming to other lecture halls via Teams / Zoom / BigBlueButton / Webex necessary.
- Transcripts after a lecture are sometimes incomplete or impossible to follow.  
**Watching the lecture again helps with learning.**
- **High rents:** Many students live far from campus. Imagine you drive 50 min. to campus every day and have only one lecture (90 min.) one day a week. Then you drive 100 min. for 90 min. of frontal teaching. → The target is location-independent teaching.
- The reality of students' lives is changing. They don't want to stick to timetables, but want to participate in their studies regardless of time. Imagine the young mother/father who only has time for university in the evenings.
- **Partly mobile set-ups with cameras in use.** Here, however, tracking usually takes place and the professor must hold the lecture in front of a camera tripod.  
**The organization, set-up and use of the system is also anything but simple and is therefore not accepted by professors.**



- **A survey conducted among more than 1,000 students found that students want hybrid classes even after the pandemic.**
- Students want to enjoy the benefits of a face-to-face university while also being able to attend virtual lectures.
- **Studies show that students' learning success is significantly increased when they can see the lecturer up close and recognize the professor's emotions**



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