Parameters of the Ambient Information System

The Ambient Information System (AIS) is developed based on the sensor-actuator system. Recorded sensor measurements are transferred to audiovisual and physical actuators in real-time, creating the responsive work environment. In the following, the technical means and parametric design settings of the staging are explained.

Sensor Measurements
- **Position**: The research facility is divided into different zones and the participant's location is determined by camera tracking: Entrances/exits, work area, intermediate area (between working and rest area), resting zone.
- **Time**: Different reactions of the AIS are triggered depending on the duration of stay or action of the participant.
- **Biodata**: The heart rate is measured via the E4 wristband: Response range: 50-110 BPM (beats per minute). An individual calibration is performed before each test run.
- **Motion**: Movements of an arm are detected by the E4 wristband, and those of the head via sensor cap.

Actuator Feedback
- **Position**: Depending on the location, different scenes are played.
- **Time**: Changes occur over predefined periods of time: fade-in, fade-out, building up or breaking down of a scene.
- **Wall light:** The RGBW LED pillars are directed at the white movable walls, which reflect the colored light. The following parameters are used for staging: color spectrum (hue), saturation spectrum (gray > full color), brightness (black-full color-white). They are controllable via DMX and dimmable.
- **Table light**: The table lamp shines only white and is dimmable via DMX.
- **Audio**: Different audio contents are played on three speakers, audio samples are accumulated, the volume is adjustable, and sound effects are applied.
- **Contact speakers**: The two contact speakers vibrate by different audio contents and volume regulation.
- **Airflow**: The fan can be varied in intensity.

Mapping Dramaturgy

Arrival (entrance / exit, left or right)
- **Wall light**: Lights up white once briefly
- **Sound**: Welcome tone

Exit (entrance / exit, left or right)
- **Wall light**: Fade-out
- **Sound**: Farewell tone

In the work area
- **Table lamp**: Fade-in on entry, fade-out on exit
- **Wall light**: Always represents the pulse: The flickering becomes more intense the higher the PBM.
    - "low heart rate": green color, little saturation and slight flickering between green (hue 0.33) and gray (saturation 0.33)
    - "medium heart rate": yellow-orange color, medium hue and saturation (yellow-light gray)

- o "high heart rate": red color, high saturation and strong flickering, red (hue 1) and white (saturation 1)
  - o transitions between "low heart rate" and "high heart rate" are smooth
- **Sound/time**: "Weather", 20 minute buildup of a storm, from soft wind to rain, to storm, to thunderstorm. Audio samples are accumulating. When exiting, the storm is removed by time-based subtraction: If the participant only goes out quickly, the storm is still going on, the longer she stays out, the less strong the storm still is on return.
- **Contact Speaker**: Activates from 90 BPM on (fade-in to 110BPM).
- **Arm movement** (E4): Bright water splash when moving, is added to the weather sound.
- **Head movement** (cap): Dark water splash when moving, is added to the weather sound.

Extreme situation in the work area
After 20 minutes the storm has reached its peak. It stays strong until the participant leaves the work area. In this insistent way, the system asks the participant to take a break in a patronizing way.
- **Wall light**: Represents the pulse with strong flickering.
- **Table light**: Light flickers on each thunderclap.
- **Sound/Time**: The storm sounds remain at the most intense level.
- **Contact speaker**: Activated at top intensity.
- **Airflow** (fan): Activated by each thunderclap.
- **Diary**: Signal for diary entry.

In the intermediate area
- **Sound**: Sooth background sounds from a busy city are played.
- No other actuators are activated.

In the rest area
- **Sound**: Five three-minute ambient soundtracks are played randomly in succession.
- **Wall light**: Each soundtrack is assigned a light spectrum, alternating between two colors (green-blue, orange-yellow, ...). They always represent the pulse: The flickering becomes more intense the higher the PBM.
  - o "low heart rate": the color hue is low and the colors crossfade between each other
  - o "high heart rate": the color hue is high and the color changes are done without fading
  - o the state from "low heart rate" to "high HR" is fluent
- **Contact speaker**: Smoothly activated on bigger arm and head movements.
- **Arm movement** (E4): Activates the contact loudspeaker (above a threshold).
- **Head movement** (cap): Activates the contact loudspeaker (above a threshold).
- **Contact loudspeaker**: Smoothly activated on bigger arm and head movements.

Extreme situation in the rest area
If the participant hardly moves for 5 minutes, the system becomes less comfortable. It invites the participant to move a little bit in a patronizing way.
- **Wall light**: Starts flickering with strongly varying hue changes, without crossfades.
- **Sound/Time**: The ambient sounds start to get distorted increasingly (sound effects).
- **Airflow** (fan): Starts pulsating with the heart rate.
- **Diary**: Signal for diary entry.

Extreme situation as default
If the heart rate remains high (threshold according to calibration) for more than one minute, the fan and the contact speaker start and a signal for a diary entry is played.