

# INNOVATION LAB FOR WEARABLE AND UBIQUITOUS COMPUTING

MACHINE LEARNING AND DATA ANALYTICS LAB

DEPARTMENT OF COMPUTER SCIENCE

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## Stress+

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*Students:*

Jonas Schüll

*Project partner:* Lehrstuhl für Gesundheitspsychologie

*Scrum master:*

Michael Nissen, Matthias Zürl

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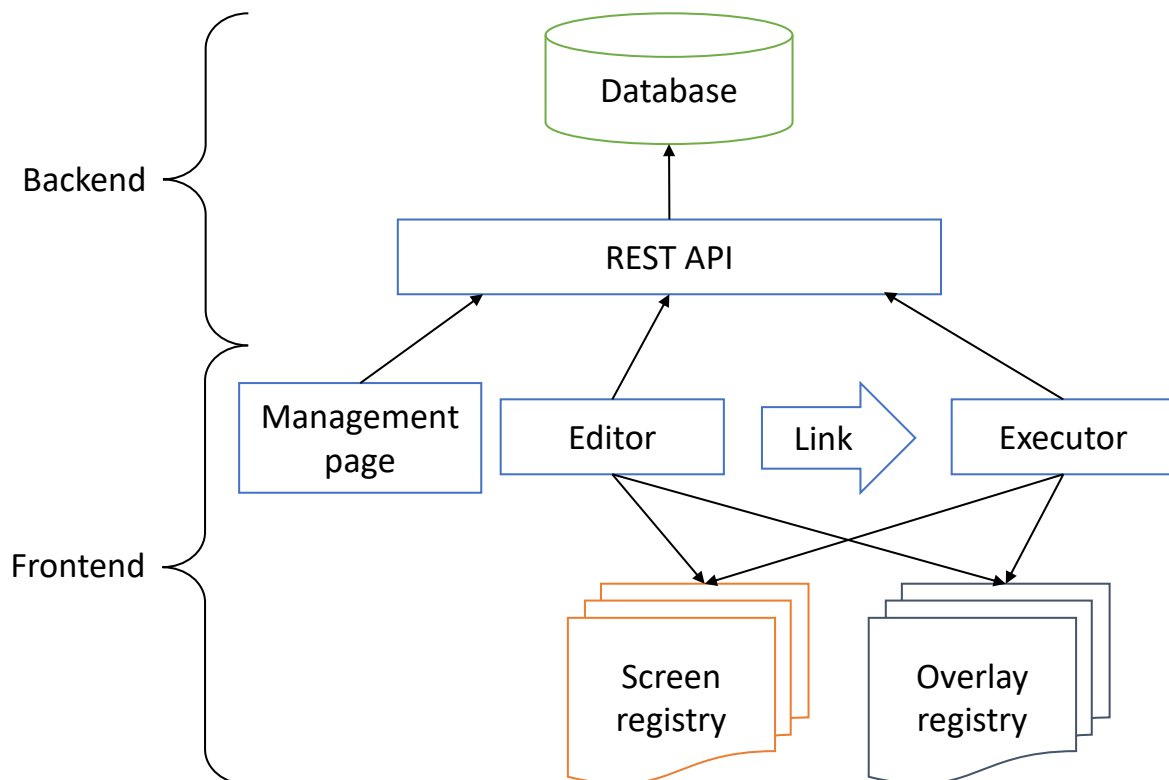
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# **1 Introduction**

This is a short introduction to your project.

## 2 Architecture

This chapter describes the architecture of Stress+. The whole architecture was designed in a way that arbitrary stress tests can be created with the given modules and new modules can be programmed and added very easily. Each stress test consist of a pipeline of screens which are show to the patient successively in the specified order. Additionally a stress test can contain overlays which are displayed on top of the screens.



**Figure 1:** Software architecture

The figure 1 shows the software architecture of Stress+, which developed as a browser based application and consists of a frontend and a backend. The main frontend components of Stress+ are the *Editor* for creating and editing stress tests and the *Executor* for executing a stress test. On the *Management page* all available stress tests can be managed. To be able to easily add new modules in the future all available screens and overlays are registered in the *Screen registry* and *Overlay registry*. Therefore the *Editor* and *Executor* are developed in a generic way and must query the registries to know which modules are currently present. After saving a stress test in the *Editor* a link is generated, which can be send to the patient so he can execute the stress test.

The backend is responsible for saving the stress test configurations and the statistics on how the patient performed. Therefore it consists of a REST API, through which the database can be accessed.

### 2.1 Frontend

The frontend is a Single-page application written in JavaScript with the React framework. The following sections describe the different frontend components in more detail

#### Screen

The stress test consists of a list of screens that will be displayed successively to the patient. A screen will be displayed fullscreen inside the uses browsers. Each screen has its own settings, which can be adjusted inside the editor. All available screens can be found in the chapter 5.

#### Overlay

The stress test can be equipped with overlays that are displayed on top of the current screen. All overlays are displayed simultaneously during the whole stress pipeline execution, therefore they do not have an order. Each overlay has its own settings, which can be adjusted inside the editor. All available overlays can be found in the chapter 6.

#### Management page

On the management page all availalbe stress test are displayed. From there you can open a stress test in the editor, delete one or create a new test. Further details can be found in the chapter 3.

#### Editor

The stress tests can be created and edited in the editor. Also every setting of the screens and overlays can be adjusted within the editor. Each stress test has a unique ID that is generated when it is saved for the first time. With this ID a link is generated that can be send to patients so they can execute the stress test. From the editor users can also download all recorded statistics for the current stress test. Further details can be found in the chapter 4.

#### Executor

The executor extracts the unique stress test id from the link and loads the stress test configuration from the backend. Then the executor will display each screen successively to the patient. All Overlays are displayed simultaneously during the whole stress test run. The executor is also responsible to collect records from the screens and persist them in the database. Further details can be found in the chapter 7.

### 2.2 Backend

The backend consists of the Database and the REST API

#### Database

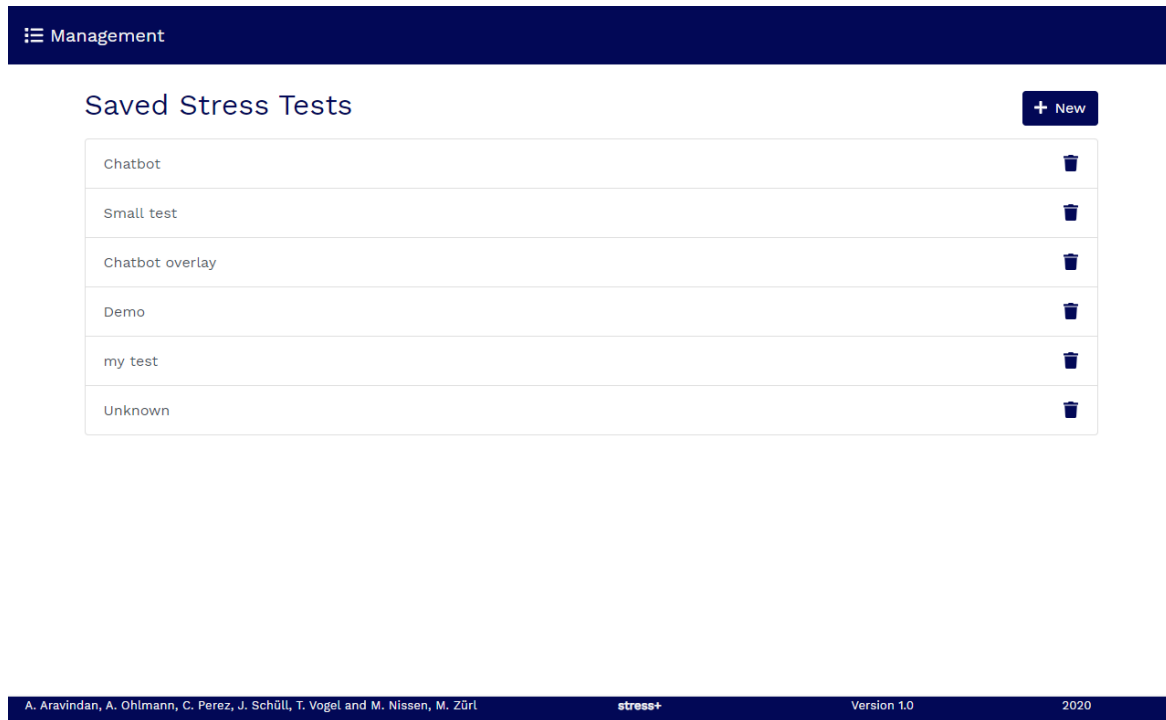
To save the stress test configurations and the results of stress test executions a database is used. Because the data does not have a clear structure, as arbitrary modules can be composed in a stress test, a relational database is not suitable. Instead the document-oriented NO-SQL database MongoDB is used.

#### REST API

The REST API acts as the connection between the frontend and the database. The REST API can be accessed via HTTP and uses JSON documents for transferring the data. The REST API is written in JavaScript on the NodeJS platform and uses the express HTTP framework.

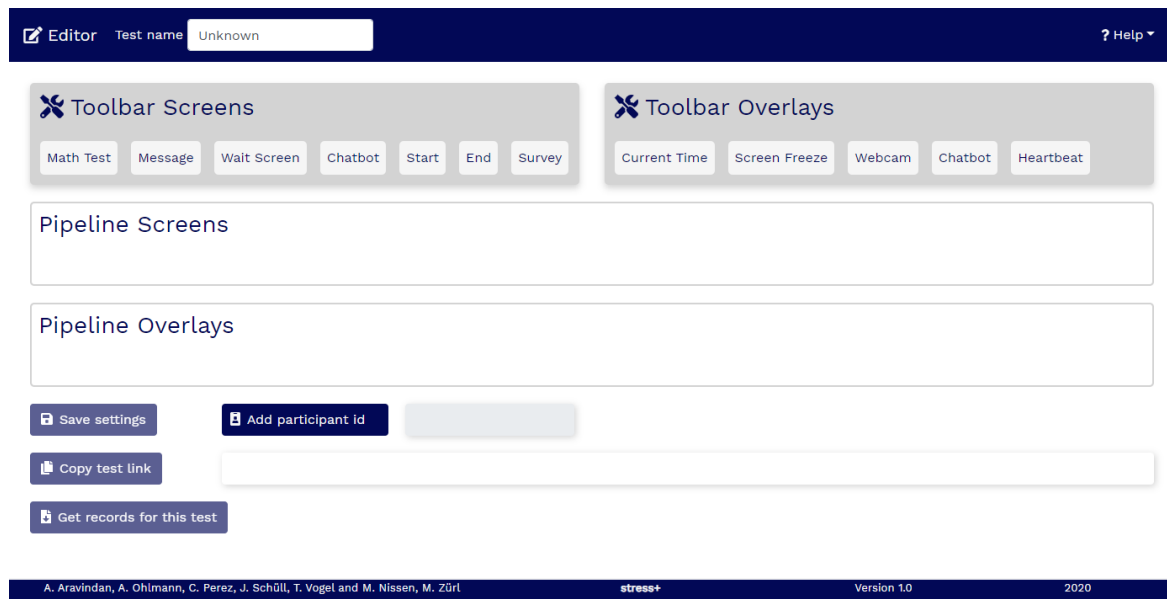
### 3 Management page

To go to the management page navigate to the root url of Stress+ and click the "Go to the management page" button. A screenshot of the management page can be found in figure 2. All previously saved stress tests are displayed on this page. You can open one of the tests in the editor by clicking on it. Clicking on the trash icon will delete that stress test. To create a new stress test click the "New" button, which will open the editor with an empty stress test.



**Figure 2:** Screenshot of the management page

## 4 Editor



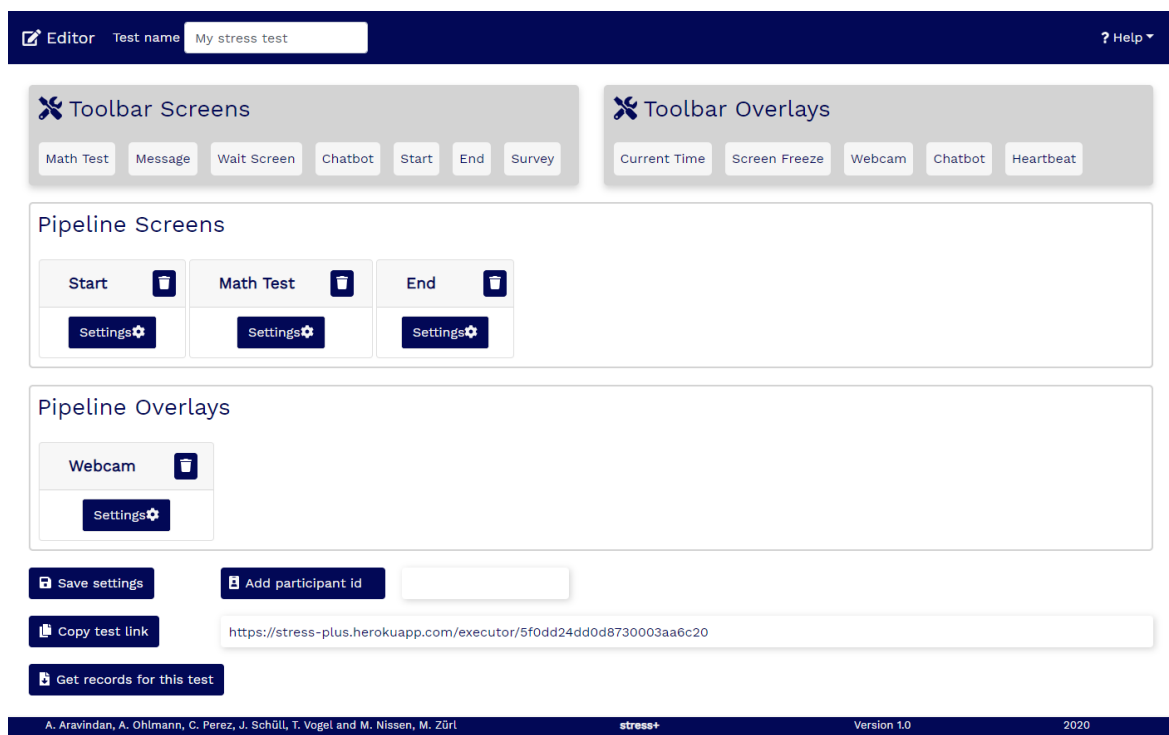
**Figure 3:** Screenshot of the editor after creating a new stress test

Figure 3 shows a screenshot of the editor with an empty stress test. With the textfield on top of the editor the name of the stress test can be changed. All available screens and overlays are displayed in the corresponding toolbars. From the toolbars the screen and overlay items can be moved onto the corresponding pipeline with drag and drop. All items in the pipeline will be used when executing this stress test. Stress test can be saved with the "Save settings" button if at least one screen item is present. Each stress test has a unique ID that is generated when it is saved for the first time. With this ID a link is generated that can be send to patients so they can perform the stress test. This link is displayed next to the "Copy test link" button, which can be clicked to copy the link to the clipboard.

Figure 4 shows a screenshot of the editor with a simple stress test consisting of a "Start", "Math test" and "End" screen. The stress test has the name "My stress test" and uses the "Webcam" overlay. By clicking the trash icon in the top right corner of pipeline items, the items can be deleted from the pipeline. Each pipeline item has a "Settings" button which can be clicked to open the settings of the corresponding screen or overlay.

Clicking on the "Get records for this rest" button will download all collected test statistics of this test in JSON format. The file will contain an array of test executions. To differentiate test executions a participant id can be added in the textfield next to the "Add participant id" label. This participant id will be added to the test link and to the test execution result, so executions can be identified easily.





**Figure 4:** Screenshot of the editor with a simple stress test

## 5 Screens

This chapter describes all available screens.

### 5.1 Math test

Property	Type	Description
answerTimeout	number	The duration in seconds for answering one math question
waitTime	number	The duration in seconds between two math questions
testTotalTime	number	The total duration of the math test
enableSound	boolean	Play an anyoing sound during the math test
enableControl	boolean	Enable control mode
difficulty	number	The initial difficulty of the math questions (Easy: 0; Hard: 4)

**Table 1:** Properties of the Math test screen

### 5.2 Message

The Message screen shows a simple message to the user. The user can go to the next screen by clicking a button on the screen. The title, the message and the button text of this screen can be adjusted.

### 5.3 Wait Screen

The Wait screen shows a simple message to the user, like the Message screen. But the user has to wait a specific time until the next screen is displayed. The user can not manually go to the next screen. The title, the message and the timeout in seconds of this screen can be adjusted.

### 5.4 Chatbot

### 5.5 Start

This screen can be used as the first screen. It displayes the Stress+ logo and can show a custom message.

### 5.6 End

This screen can be used as the last screen. It displayes the Stress+ logo and can show a custom message.

Note: The end screen has no mechanism to go the next screen if it is placed in the middle of the pipeline. If the end screen is not present a blank page will be shown as last screen.

## **5.7 Survey**

The survey screen can display other websites inside the stress test. This can be usefull to display Google Forms inside a stress test. A button will always be displayed on the top of the screen to navigate to the next screen.

# 6 Overlays

This chapter describes all available screens. For easy positioning of the overlays, an overlay can have the optional property `position` which controls the position of the overlay on the screen.

## 6.1 Current Time

This overlay just displays the current time with hours, minutes and seconds.

## 6.2 Screen Freeze

The screen freeze overlay will block all user input for a configurable amount of time to induce more stress. The freeze will start after a configurable amount of time. The timer will run as soon as the first screen has started and does not take into account how long a user may wait until he clicks the next button on the Start or Message screen. Therefore it can not be controlled on which screen the freeze happens, if a screen with a next button is in the stress test.

## 6.3 Webcam

The Webcam overlay will display the live recordings of the users webcam on the screen. To be able to access the webcam the user must give the Stress+ website the permission to do so. Some operating systems might also restrict the access to the webcam. If the webcam can not be accessed, the stress test will continue without displaying the live recordings of the webcam.

## 6.4 Chatbot

This is an overlay version of the Chatbot screen, that can be opened and closed via small button. For further details consult the Chatbot screen documentation.

## 6.5 Heartbeat

This overlay will display the heartrate next to a heart image with a bumping animation. The heartrate is completely faked and will slightly increase over time. This overlay can be displayed delayed by specifying a duration in seconds after which it will become visible.

## **7 Executor**

Screens will receive the settings and a callback function as properties. The callback function must be called when the current screen is finished, so the executor can show the next screen. All Overlays are displayed simultaneously and each overlay gets their settings as properties.

# 8 Development

## 8.1 Adding new Screens

Every screen must be registered in the screen registry to be available. Following properties must be specified when registering a screen:

- The unique name of the screen
- The React component for displaying the screen while executing
- The React component for displaying the settings of the screen inside the editor
- The initial settings of the screen

When a screen is displayed during the stress test execution, its React component will receive two properties. The `settings` property will contain the settings. The `onFinished` property is a callback function, which must be called when the current screen is finished and the next screen one should be displayed.

## 8.2 Adding new Overlays

For easy positioning of the overlays, an overlay can have the optional property `position` which controls the position of the overlay on the screen.

Every Overlay must be registered in the overlay registry to be available. Following properties must be specified when registering an overlay:

- The unique name of the overlay
- The React component for displaying the overlay while executing
- The React component for displaying the settings of the overlay inside the editor
- The initial settings of the overlay

When an overlay is displayed during the stress test execution, its React component will receive its settings inside the props.

## 9 Deployment