Finding a place to learn: A mobile study room guide with integrated room occupancy rate indicator

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1. SUMMARY

An essential part of student life is to study for exams - together and alone. Many students look for a place to study on the university campus to be able to better focus or get assistance from fellow students. However, they have problems finding a suitable spot. Freshmen usually do not yet know common places to study and especially while exam preparation phases the demand for study rooms is high. At these times, students often do not find a place to study or have to invest a lot of time to find it.

At the request of our students and in cooperation with the students' union executive committee (AStA[1]), we have developed a solution within our university app RWTHApp[2], which tackles the issues above – a study room guide with integrated room occupancy rate indicator. It provides an overview of all official study rooms on campus and their features. It also displays an indicator for current and predicted future occupancy rates in a user-friendly way. Students can find study rooms more easily, plan meeting with fellow students beforehand and thereby collaborate better. They can better cope with times of high demand, because they know more places, in particular previously less known ones. This leads to a better overall occupancy rate of available rooms while resulting in more available seats in each individual room.

The focus of this paper lies in the description of the mentioned feature and its implementation.

2. APP FEATURE

The first part of this feature, a list of all available study rooms, already existed before our implementation as a list on the university website. By including this in the official university app, we raised the visibility of this list. In general, we found discoverability to be lacking in traditional university websites.

Besides a list of all official study rooms on campus, the feature offers a corresponding map view. The former offers various filter and sorting options to efficiently find a fitting and currently open study room with available seats. It allows filtering by room features such as Wi-Fi connectivity, accessibility, available power supply and room type (e.g. discussion room). Sorting by distance and opening status is possible. The map view enables students to see their own location and the position of study rooms at a glance, while displaying the current occupancy rate and opening status of a room. In both views, it is possible to view more room details for each study room.

The room detail page reveals different room characteristics like a room feature overview, the exact opening hours and a map of the study room location and its near surroundings. The map serves as a link via which an external map application can be opened, allowing the user to get navigation.

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[1] The students' union executive committee (AStA) represents the students' interest at RWTH Aachen University.

[2] The RWTHApp is an especially for RWTH Aachen University students designed and developed hybrid app. It offers fast, mobile access to selected information of the most common university tools and other useful features that make daily students' life easier. (Politze & Decker, 2014)

Furthermore, the page provides not only the current but also the hourly estimated room occupancy rate for the next three days in form of graphs.

Lastly, a feedback view is available to collect data for a continuous improvement of the calculated occupancy rate indicator. Users can provide feedback whether the current occupancy rate is greater or less than the one displayed or report the exact number of students in a particular room.

3. DETERMINATION OF CURRENT AND FUTURE ROOM OCCUPANCY RATE

Nowadays almost every student carries one or more mobile devices. Most of these devices are permanently connected to the internet. While students are on the campus, they usually use the university Wi-Fi "eduroam". This enables us to estimate the current occupancy rate of study rooms based on the number of currently registered devices at access points near a particular room. This number of devices can then be used to get an estimation for the number of students currently in a room.

To do this, the algorithm divides the number of registered devices per access point by an empirically determined constant. This constant weighs in factors like multiple devices per user and overlaps between access point ranges.

All mentioned metrics do not entail any personal information for privacy reasons. Because of this, the user count has to be estimated and cannot be directly retrieved.

The values for future time slots are determined by a machine learning algorithm using the past occupancy rates as base data to predict future occupancy. With this approach, the forecast takes not only weekdays and periods into account, but also lecture and lecture-free periods (Selzer, Asteriadis, & Politze, 2017)

4. OUTLOOK

The number of devices currently connected to an access point, as described above, is an exact number. Inaccuracies come into the algorithm when converting this to the number of users and relating this data to a specific room. Currently, this calculation uses a constant conversion factor. By using the feedback provided by users, it should be possible to improve the conversion with the help of machine learning algorithms.

Moreover, the displayed study room information is curated in a list only for this purpose. This leads to duplicate data especially when it comes to the base information of a room like its location. In the past, this lead to inconsistencies when rooms were removed as study rooms in an internal system but not on the public list. In the long-term, the study room feature will instead use data offered by the university-wide room management system. This, however, requires changes in the management system.

5. REFERENCES

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6. AUTHORS' BIOGRAPHIES

Ramona Renner studied Media Computer Science with focus on Human-Computer Interaction, Accessibility, Media Technology and Art & Design. She received her Diploma from Technische Universität Dresden in 2016. Since July 2016, she works at the IT Center of RWTH Aachen University as Interaction Designer & Front-End Developer.

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