Experiential Design – Rethinking relations between people, objects and environments

• Paper / Proposal Title:
Quantifying human behavior in indoor spaces with non-invasive sensors

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• Abstract (300 words):
Research shows that human behavior correlates with the choice of space design. In-the-field research of this link between humans and space design is limited to studies with data originating from manual observations, participants carrying wearable devices or interviews/surveys. Due to the nature of these methods the data volume is restrained. By applying technological improvements such as computer power, analytical algorithms and non-invasive sensors (from other industries) to the study of humans in indoor spaces, it has become possible to improve the statistical power and thereby strengthen the evidence-based architectural design process.

This study presents a new methodology for analyzing human behavior in indoor spaces using 3D-depth cameras as sensors. Depth cameras assures the method falls in line with regulations and restrictions regarding measures concerning person sensitive data. All
users within the space automatically becomes part of the study without the need for a prior consent. This significantly increases the number of participants and scale of data compared to similar studies conducted in the past. The review of the methodology is based on an in-the-field test-period of 8 days in a restricted space in public library, primary occupied by academic students.

The approach enables analysis of individual human behavior-metrics with an unseen volume, precision and accuracy. Metrics such as seating-patterns, length-of-stay, number-of-breaks, group-dynamics and level-of-social-interaction are quantified. To examine the link between human behavior and space design, as well as to validate the method, a radical interior object in the space were changed half-way through the test-period. Comparing prior and post data revealed changes in human behavior.

This paper presents a validated tool to be used by architects and environmental psychologists to study human behavior in indoor spaces. Furthermore, this can complement the human orientated design approach by adding a higher level of statistical power and intelligence behind the decision process.

• Author(s) Biography (200 words each):

Andrew Khoudi is a second year industrial phd student at Aarhus School of Architecture, Denmark together with industrial sponsor Schmidt Hammer Lassen Architects and Soren Jensen Consulting Engineers.

The candidate’s academic background is within signal processing and prior to commencing the PhD program, Andrew Khoudi spend nearly 10 years in the industry. Initially, Andrew Khoudi joined a consulting engineering company for 6 years. The main task was planning and designing large Danish hospitals. This was done in close collaboration with architects, which allowed the candidate to establish an in-depth understanding of the architects’ work methods and culture. Afterwards, 4 years were spent at a tech start-up developing sensors and analyzing data to quantify human behavior in indoor spaces to improve the user experience. Primary spaces to be monitored and analyzed were learning environments such as universities and public schools.

As an alternative PhD student within the architectural environment, the candidate aims to research in methods making the architectural design process of indoor spaces more data driven. The main focus of the research is to enable use of sensors and algorithms to extract information on human behavior and how to improve the user experience by adjusting the interior space design.