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Publication Title

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Abstract

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Keywords: Dynamic Photovoltaics, Multi Functional Envelope, BIPV, Adaptive Shading

1. Introduction

2. Outline

Working Title: Methodology for the in-situ collection of indoor occupant comfort data

Lead: PJ Co-Authors: Matias, Negin, Clayton

Keywords: Mood Logging, Comfort Feedback, Data Collection, Fitbit, Comfort Recommendation

Introduction: - 2012 Survey of 52'980 occupants in 351 office buildings found that 50% were dissatisfied with their indoor environment [/cite Frontczak 2012 Indoor Air] - The causes of occupant dissatisfaction can result in health impacts - A lot of this discomfort has been prooven to be a result of the one size fits all model that is applied to current buildings /cite Byrne2005 Journal of Applied Physiology Kingma 2015 Nature climate change - Moving away from a one size fits all model requires the analysis of multiple individuals with varying comfort preferences. This however is not trivial.

State of the Art - The state of the art in comfort data collection is through surveys, where the test subject is placed in a controlled testing room and asked to provide comfort feedback. Although this works, it has three main limitations

Problem Statement - Firstly the methodology cannot be scaled to large sample sets due to the administrative overhead in setting up user based studies - Secondly the user is often out of their natural working or living environment - Thirdly there is also the issue with survey fatigue (find citation)

Goal This paper propses a novel form of user comfort data collection using a wearable health tracker, in this case the fitbit, with 25million active users [source: https://investor.fitbit.com/press/press-releases/press-release-details/2018/Fitbit-Reports-571M-Q417-and-1616B-FY17-Revenue/default.aspx

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] - The fitbits success stems on the ability for users to better understand and evaluate their own health, whether its the calories they burnt or the hours slept. - This paper presents the first proof of concept of a comfort evaluation, tool, that when combined with local environmental data can allow the user to better understand their comfort profile, and thus attain information about working spaces that best suit their corresponding profile

Method - Utilisation of smart watches, in this case the fitbit - Simple three point scale - Why a three point scale was chosen over a more complex scale - Incentive to use the app helps people gain a better understanding of the physiology, in the same way people track their sleep - How data is stored in InfluxDB and managed - How the data can be cross compared with other sensors. In our case, local - Maybe the recommendation engine if ready

Results - Preliminary data from the small sample set - Preliminary results from the recommendation engine - How the users found their experience with the fitbit, and whether they are interested in the data -

Conclusion - Functional app clock face which can be downloaded for free from the fitbit store - Data was aquired and stored successfully - User feedback - Researchers are welcome to use our software to conduct their own crowd sourced comfort studies

Outlook - this method allows for large complex data studies to be carried out - Spacematch will be launched in full

- Buildings are responsible for significant energy consumption

- Recent developments in the efficiency and costs of thin film BIPV technologies allow for integration into the facade

- Dynamic building envelopes can save energy by controlling direct and indirect radiation into the building, while still responding to the occupants desires

- Previous research

- Review of ASF Simulation Paper

- Sensitivity of the Simulation on the building energy performance

- This paper extends this work by running the simulation to a variety of building archetypes in Zurich

3. Methodology

The methodology runs the ASF Simulation. It will be briefly reviewed here for Simplicity

3.1. Solar Radiation Evaluation

3.2. Building Simulation Model

3.3. Sensitivities

Within this framework, three sensitivities will be analysed:

Building Envelope: The building envelope is characterised in the RC model as H_w. ...

Infiltration: The infiltration rate is modified in the H_{ve} component of the RC model...

Thermal Capacitance: The thermal capacitance of the mass is denoted as C_m in the RC model. It...

3.4. Analysis of Archetypes

- Building Archetypes are taken from CEA tool and evaluated within the ASF Framework
- Table of Input Parameters for the different buildings

4. Results

4.1. Influence of Envelope Resistance

4.2. Influence of Infiltration

4.3. Influence of Thermal Mass

4.4. Archetype Evaluation of the ASF

5. Discussion and Conclusion

6. Acknowledgments

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