

# **Biological Rhythm Aware Office Lighting Control**

Citation for published version (APA):
Papatsimpa, C., & Linnartz, J. P. (2020). Biological Rhythm Aware Office Lighting Control. Poster session presented at 2020 Society for Research on Biological Rhythms meeting .

# Document status and date:

Published: 01/06/2020

## Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

# Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

## General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- · Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
  You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

## Take down policy

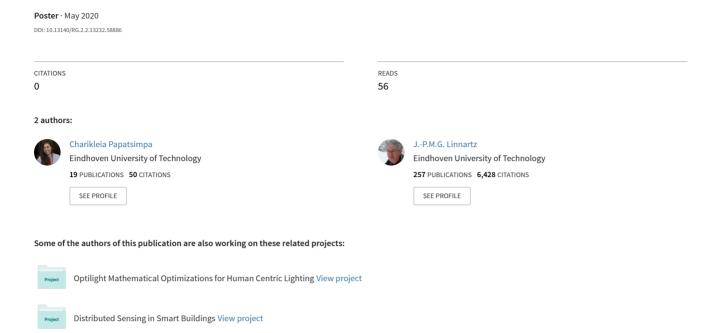
If you believe that this document breaches copyright please contact us at:

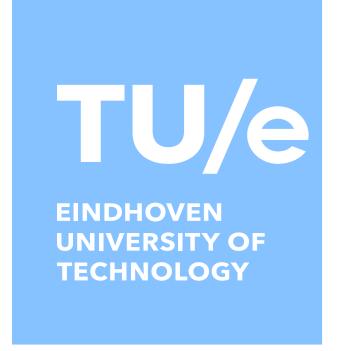
openaccess@tue.nl

providing details and we will investigate your claim.

Download date: 08. Feb. 2024

# Biological Rhythm Aware Office Lighting Control









Chara Papatsimpa is a current a post-doc researcher at TU/e. Her work is concerned with mathematical optimizations for human-centric lighting. Specifically how our existing knowledge on the circadian effects of light can be translated to formal lighting control optimizations.

# Biological Rhythm Aware Office Lighting Control

Charikleia Papatsimpa<sup>1</sup> and Jean-Paul Linnartz<sup>1,2</sup>
<sup>1</sup>Eindhoven University of Technology, Eindhoven, the Netherlands
<sup>2</sup>Signify, Eindhoven, the Netherlands

What is the problem?

We spend
90%
of our time
indoors

Evening light exposure is high (smartphones, TV

Indoor light levels are low

85% of people use an alarm

Resulting in

"Social jet-lag"
Misallignment of biological and social time

We translate insights from chronobiology to practical lighting recipes to enhance health and well-being through offering personalized light "nutrition"

# Our solution



# Methods

 We use quantitatified models of the effects of light on human pacemaker

$$\dot{x} = \frac{\pi}{12} \left[ y + \mu \left( \frac{1}{3} x + \frac{4}{3} x^3 - \frac{256}{105} x^7 \right) + B \right]$$

$$\dot{y} = \frac{\pi}{12} \left\{ qBy - \left[ \left( \frac{24}{\tau \cdot 0.99729} \right)^2 + kB \right] x \right\}$$

- We formulated the system as a formal mathematical optimization problem
- Inroduced a novel algorithm to solve the highly non-linear problem

# Personalized lighting pattern for every employee

Light profile depends on history of light exposure, user habits and preferences

