Master project: Mixed optimization in lighting design

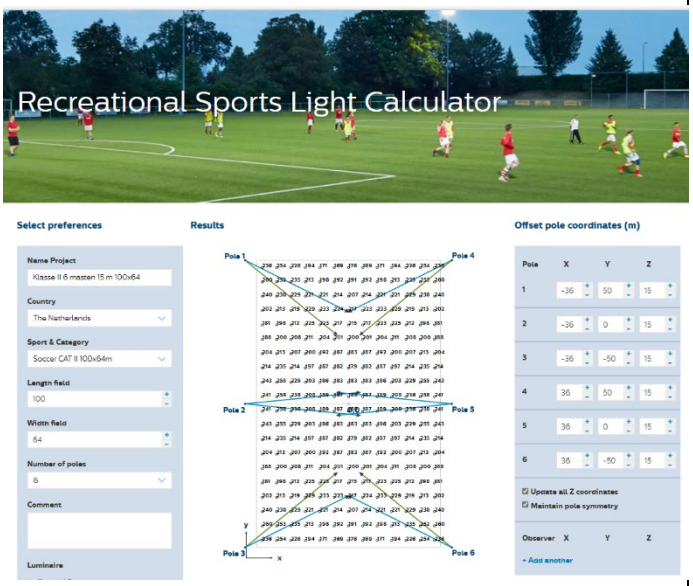
Problem description

Luminaires need to be placed and directed in a free space such that 1) requirements are optimally fulfilled and 2) the solution is of interest. Luminaires emit a defined light distribution which means an intensity that varies over angles.

The degrees of freedom for the optimization are: the number of luminaires (discrete), the type of each luminaires (discrete), the x, y, z position of each luminaire (continuous), and the $\theta\phi$ orientation of each luminaire (continuous). Sometimes the degrees of freedom may have constraints such as number of luminaires is fixed to 8, luminaires xy coordinates are constrained to lie on a line, or θ cannot be larger than some value.

The resulting design needs to fulfill a set of requirements which are in general non-linear. Examples are:

- Minimum of light over measurement points needs to be above a certain value.
- Average of light over measurement points need to be above a certain value



A lighting design that fulfills the requirements can be attractive for various reasons. One reason may be costs which can be driven by the number of required poles, the height of the poles, and the number of luminaires. Other reason can be to have the highest average lux or the highest uniformity or an amount of symmetry.

Assignment

Develop an algorithm that takes as input constraints on degrees of freedom, a list of requirements, and a list of preferences; and compute an optimal lighting design within 5 minutes on a compute-server when the number of degrees of freedom is 30. Of importance is that the algorithm can also deal with e.g. 500 degrees of freedom (scalability). A method of interest is have a table of lighting designs present, select a few designs that are close to the problem at hand, and perform local optimization.

We are…

Signify, the new company name of Philips Lighting, is the global leader in lighting building on 125+ years of innovations. Our purpose is to unlock the extraordinary potential of light for brighter lives and a better world. We are proud to be ahead of the game in the Internet of Things and on track to be carbon neutral by 2020. We learn through disruptive challenges and our performance is powered through our diverse teams. Our Philips products, Interact connected lighting systems, and data-enabled services transform people's lives in homes, buildings, and public spaces.

We define the meaning of light…join us to #findyourmeaning @ Signify!

This role is part of the Signify IoT sensing team, within Signify Research, responsible for innovation on new sensing technologies. Its responsibilities are at the heart of Research, so aspiring for so innovation, creativity and perseverance, must be in your DNA. Are you the enthusiastic, talented intern we're looking for?

Together we can…

- Explore constrained optimization algorithms.
- Develop algorithms that help our customers with designing in our products
- Test solutions with business partners and in case of success we will deploy the algorithm online

You are…

- Master student in the field of mathematics
- Skilled in programming, preferably python
- Able to work independently and find your way in solving problems

Contact

fetze.pijlman@signify.com