
Living spaces - dynamic lighting and music

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Overview

- Dynamic living spaces
 - Ambient music and lighting
 - Reading human signals with AI
 - Emotion detection + Raspberry Pi + LEDs
 - Conclusion
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We create our environment

Bee hive



[P]

and our environment creates us

Japanese sand
garden in Monaco



[W]

Not only smart, but “caring” homes

Ambient environment affects learning, mood, and interactions

Hack home lighting, music, etc

Anticipate algorithms that maximize personal target functions with machine learning

Hardware + software setup

- Raspberry Pi 3B (for deep inference use NUC or NCS)
 - Camera software: fswebcam (or raspicam, OpenCV)
 - Emotion detection: Microsoft/Oxford Emotion API
 - Free trial good for ~1000 API calls
 - WS2812 addressable LEDs
 - Library for controller: github.com/jgarff/rpi_ws281x
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Projecting emotion scores into color space

Task: find the matrix P that projects emotion scores onto RGB space:

$$P \begin{pmatrix} \textit{anger} \\ \textit{contempt} \\ \textit{disgust} \\ \textit{fear} \\ \textit{happiness} \\ \textit{neutral} \\ \textit{sadness} \\ \textit{surprise} \end{pmatrix} = \begin{pmatrix} \textit{red} \\ \textit{green} \\ \textit{blue} \end{pmatrix}$$

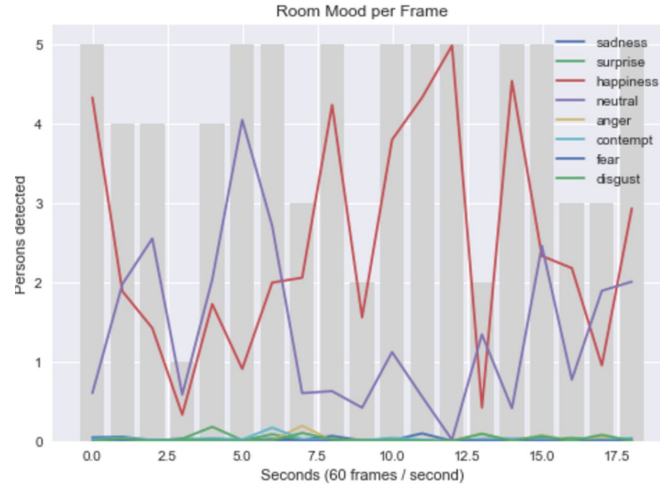
example:

$$P \begin{pmatrix} 0.00 \\ 0.00 \\ 0.00 \\ 0.00 \\ 0.65 \\ 0.05 \\ 0.00 \\ 0.30 \end{pmatrix} = \begin{pmatrix} 180 \\ 170 \\ 10 \end{pmatrix} =$$



Human signals as data

Can be extended to read other human signals, eg, motion, posture, etc.



Human signals, continued

Body pose/gestures as input:



Human signals, continued

Analysis of emotions in a room.
<https://youtu.be/urHMHEAgpPo>



Emolight

Emotion detection with Raspberry Pi, computer vision API
and LED strip demo

<https://github.com/JustinShenk/emolight>

Outlook for human signal apps

Living spaces that:

- read human and social signals
 - perform machine learning
 - optimize a target function (happiness, etc.)
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Conclusion

- Lighting and sound are promising targets for machine learning in a sensory environment
 - Developing not only smart homes, but *caring* homes a task for future researchers and developers
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Image sources

[I] - Intel DevMesh, user: JustinShenk,
<https://devmesh.intel.com/projects/party-pi-group-dynamics-analytics>

[P] - Pixabay, user: Pollydot,
<https://pixabay.com/en/bees-honey-honey-bees-honeycomb-345628/>

[W] - Wikimedia, user: Tangopaso,
https://commons.wikimedia.org/wiki/File:Japanese_garden_Monaco3.jpg.
