

Recording and Analysis of Rate of Breathing and Pulse Over Time

It is common knowledge that the heartbeat and breath time of a person are highly correlated, with both being dependant on metabolism and exertion. We set out to test the change of heart rate and breathing of a person both over the course of the day and in relation to significant activity.

Standard pulse sensors are available on the market, but breath sensors are not. After attempting breath sensors that use accelerometers and temperature sensors, finding both approaches had their drawbacks (off-the-market accelerometers aren't sensitive and stable enough for our use case, while temperature sensors might not work in a variety of situations), we settled on the use of a piezoelectric disc strapped against the chest to measure the pressure exerted during inhalation.

Data was recorded via an arduino, stored into a MongoDB database through python, recording the time and context of all readings. A preliminary analysis was performed on the data, identifying outliers that were cleaned. The breath data was then munged into a usable format, before the same process was applied on it as well.

We then plotted a scatterplot of the heart-rate vs the breath time, finding high negative correlation between the two. The higher one's pulse, the shorter the breaths they took. Furthermore, the data was compared at different times of day after different levels of activity.

As expected, both heart rate and breathing time varied over the day, the former being relatively low in the morning, night, and just after lunch while it was higher late into the morning, early afternoon, and after some exercise. This corresponds to known information about the variance of body metabolism over the day and with exercise, further solidifying it as a common source that affects both heart rate and breathing time, albeit to different extents.