Description of collected data

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1 Introduction

This document delineates the data found within the BAS benchmarks github page [1]. It also presents the *Building Automation Systems (BAS) Laboratory* found within the Department of Computer Science at the University of Oxford, from the data has been collected. This Smart Buildings Laboratory is composed of two sensorized rooms which form part of a larger building Management System (BMS). The rooms aim to serve as a test bed for deploying optimization and verification methods with the aim of achieving higher energy efficiencies.

The document is divided into two sections. In the first section, a description of the data is presented (format and type). This is followed by an overview of the sensorised rooms together with details on their usage.

2 Description of data

We provide data collected from the BAS laboratory. It encompasses data having a sampling time $\mathbf{\Delta T = 5}$ **minute** and dated between,

`01 April 2016 00:00 - 31 October 2017 23:59.`

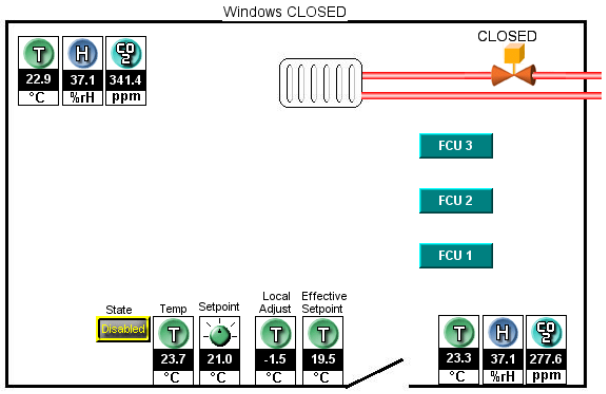
We present the data in the form of text files stored within a folder corresponding to an individual BAS component. Each filename represents a different sensor. Within each file, one can find the sensor measurements in the form of `"date time value"` for each sample. The data has been sorted in ascending order and cleaned from any duplicates. Table 1 lists the available data, where *RH* corresponds to relative humidity.

Table 1: Description of available data

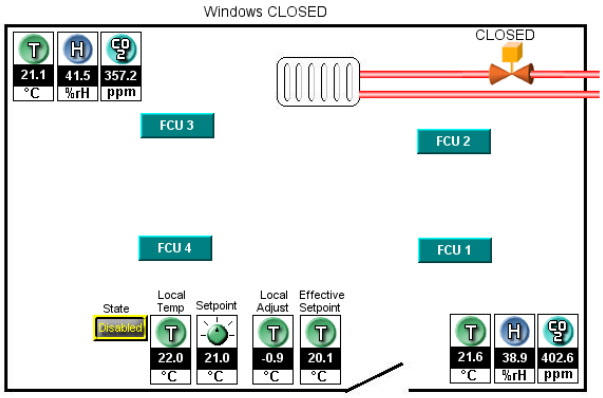
Component	**Measurements**
Air handling unit (AHU)	Supply temperature (^oC)
Radiator	Flow temperature (^oC)
Valve	AHU heating valve (%)
Room 1	Average space CO_2 (ppm) Average space temperature (^oC) Average space humidity ($\%RH$) Fan Speed (m^3/min) Heating set-point (SP) (^oC) Space CO_2 (ppm) Space temperature (^oC) Space humidity ($\%RH$) SP adjust override (^oC) Trimmed SP (^oC)
Room 2	Average space CO_2 (ppm) Average space temperature (^oC) Average space humidity ($\%RH$) Fan Speed (m^3/min) Heating set-point (SP) (^oC) Space CO_2 (ppm) Space temperature (^oC) Space humidity ($\%RH$) SP adjust override (^oC) Trimmed SP (^oC)
Weather	Outside air temperature (^oC)

3 Description of the teaching rooms

The sensorized teaching rooms can be found on the 4th floor of the Department of Computer Science Building. The two rooms have been equipped with a Trend Controls BMS system which is linked to the University of Oxford's main BMS system. The layout of each room is depicted in Figure 1, while the dimensions and the HVAC equipment in each room is tabulated in Table 2. A separate air-handling unit (AHU) is used for both rooms and proximity sensors



(a) Room 478



(b) Room 479

Figure 1: Room Layouts

have been installed on all doors and external windows to allow for detection of opening and closing of the doors and external windows. Each zone can be heated up both by air coming from the AHU and internal radiators. The zone set-point is typically set to 21^{o}C and occupants can tune this set-point by up to $\pm 3^o$C. The outside air temperature is also monitored and recorded. Note two temperature sensors have been newly fitted in the rooms; the third sensor was kept from previous installations, hence the discrepancy between the number of temperature vs CO_2 / humidity sensors. The rooms are generally occupied on Monday -Thursday between 08:30 - 17:30, Friday between 08:30 - 12:30 during term times. The heating system is in turn only operational during term times, excluding weekends.

Table 2: Tabular Description of rooms and their sensors

	Room 1	**Room 2**
Room Size (m^2)	94	96
# External Windows	1	2
Area of Windows (m^2)	1.325	9.841; 0.956
# Doors	1	1
#Radiators	3	5
Fan Coil Unit	3	4
Temperature Sensors	3	3
CO_2 Sensors	2	2
Humidity Sensors	2	2
Desktop Computers	20	20

References

[1] Nathalie Cauchi and Alessandro Abate. Benchmarks for cyber-physical systems: A modular model library for buildings automation. In *IFAC Conference on Analysis and Design of Hybrid Systems*, 2018. Under review.