# H.Dip Sci. Computer Science

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# Semester 2: Computer Systems & Networks

# Assignment 2

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### Introduction

At the onset of the global pandemic of 2020, the Dublin government introduced a range of measures aimed at protecting the consultants at the HSE, whose backhanders are integral in continually maintaining the plutocracy.

As a result, all bars have been forced to close indefinitely. One of the many negative consequences of these closures, is the physical deterioration of the premises of public houses, in a small part due to a lack of income, but more importantly due to the lack of activity, footfall, and general presence of customers and staff on the premises.

While the physical aging and deterioration of any building takes many forms, the area of concern here is the presence of mould and dampness, which is especially prevalent on older buildings. This issue is of greatest concern during the winter months, when the temperatures drop, and the air is generally damper. However, during the month of August, when in our own rural family run pub, I noticed huge amounts of mould growing all over the bar, in places never seen before (shelves, walls, doors, even on the plastic inside the cash register). This is therefore not only a winter problem, but also can be precipitated during the hot summer months, due to high humidity levels.

Apart from maintaining high levels of hygiene to kill any source of nutrients from which the moulds feed upon, the ambient conditions need to be controlled in order to impede the proliferation of the mould and general dampness (smell etc.). This can be done in a number of ways, including temperature control (central heating), humidity control (dehumidifier) and ventilation (air conditioning, fans, opening windows etc.).

In order to offset against the impact of environmental pollution (a large proportion of which is caused by the general population’s lazy, ‘blame it all on Trump’ waste culture), and in doing so, to reduce utility bills, it is not only imperative to introduce the above mentioned ambient controls only when they are needed, but measures should be taken to be selective in the mode of control used, i.e. if there is no high levels of humidity, or dampness, but the temperature is quite low, then only temperature control measures should be implemented, and no humidity controls etc.

I therefore propose implementing a system, whereby certain atmospheric controls are implemented on the premises on an ‘as needed’ basis. Such controls would be activated based on real time monitoring of the remote ambient conditions. These reactions would obviously have to be somewhat capped, because maintaining the temperature of the unused, uninhabited bar facilities at an optimum level to impede the growth of mould etc. throughout the whole winter, is entirely unfeasible. Therefore, a system would have to be implemented whereby the temperature control would be limited to only take effect for finite, pre-configured periods of time. During the coldest months of winter, this would essentially amount to the central heating being run on a timer basis, and not actually coming on only when temperatures dip below a certain threshold (because the temperatures would *always* be below that threshold), however, as the Spring and Summer months roll on, there would be no need to adjust the temperature control system, or to switch it off, as the full effect of the *reactive* nature of this system would then begin to take effect.

As high levels of humidity and dampness are not as prolonged in duration, the humidity controls need not be capped.

As ventilation is not based on atmospheric conditions, and instead is time based, its implementation will be dependant on a combination of time and the temperature control system. The purpose of ventilation is to introduce fresh air to the premises – removing all stale air and any associated particles, spores, micro-organisms etc. in order to do this in a cost effective and efficient manner, best practise would be to only ventilate when the temperatures inside exceed those outside, so that the hot internal air can quickly follow convective currents to escape the premises, therefore providing thermodynamic equilibrium. This approach also provides a very low-tech solution to determining that the premises are fully ventilated, i.e., temperature equilibrium can be confirmed, by comparing the internal temperature against a known standard (the external atmospheric temperature at the time), and temperature equilibrium would provide a reasonably accurate indicator that the building has for the most part been fully ventilated. The ventilation control system would act by sending an alert to the owner to open their doors/windows (or in the case of a building with smart windows – if such a thing exists yet – the windows would open automatically), and to further speed up the process of removing the air from the building, internal fans would be alerted to begin operation at roughly the same time. The activation of this system would be dependant on a combination of a number of factors, including the current status of the temperature control system (is it currently in place or not), and how long it has been since the last time this was activated. Also, in cases when this is activated due to the temperature control system being activated and temperature equilibrium reached, the temperature control system would need to be appropriately reactivated to return to the high temperatures needed inside to combat the mould growth, to avoid completely negating the temperature control in the first place.

### Proposed Technologies

This would require the use of a raspberry pi, and accompanying sense hat, which has the capability to measure both temperature and humidity. A compatible smart plug would be required to control the internal electronics (fans, dehumidifier, portable storage heater etc.). Although it is outside the scope of my proposal due to the limitation of technology at the pub at home, if such a system were ever to go to commercial use, it would also include other smart home technologies, such as central heating control, and air-conditioning.  
Note: This system could long outlast the Pandemic, as there are many derelict building across the country (apart from closed down businesses) and such a system could be introduced in those cases to slow down their decay and dilapidation).

### Proposed Tools

I would create an app written in python (using visual studio), which would handle the data sent from the RPI (broadcast using an MQTT protocol - HiveMQ). This app would then generate the requests to switch on the smart plugs using the IFTTT service.