The three Smart-Its food artifacts to be demonstrated in the Jamboree are **wine**, **cheese** and **oysters**. Each of these foods has a different lifecycle, which spans from production of the item (i.e., farmed from the sea, bottled, ripening etc) to its end in either being served/consumed or going bad. The quality of a food artifact is determined by where it is in its lifecycle and how it has been treated throughout.

application

Potentially, at each point in the lifecycle of a food artifact, its quality can be measured, and used by the restaurant application to determine such things as price of the item. For the sake of the demo, this will be quality characteristic of each food artifact at different **states** ('storage in the fridge', for example). These states are determined by perceiving the context/change-in-context of the food artifact (in relation to the fridge, wine rack or preparation counter) and perception of the artifact itself (for instance temperature or other sensor/multi-sensor values).

We should point out that here we are asking for the quality of individual food items. From the application side, we will deduce more complicated values (for price etc.) based on relationships among multiple items.

modeling quality

From the application side, we would like to be able to query the quality of food artifacts. We imagine this quality to be a value along a **'decay curve'** of a food lifecycle. The decay curve would be determined by the identity of the item and perception of its state.

In this document we suggest how the decay curve could be modelled using rising and declining slopes of a line to roughly model the rise and decline in the quality of an item in relation to different states over time. Generally, we represent these at straight lines, however there are a few points at which the quality changes exponentially.

for demonstration

For demonstration purposes, we would like to be able to exaggerate the rise and decline in food quality of items. This means that we could have access to variables for changing/calibrating the amount of exaggeration of each item at each state in its lifecycle. We thus need to have access to coefficients of proportionality in order to be able to calibrate the speed and amount of decay (i.e., rise and decline in quality). These should be able to be queried and changed through the API.
Additionally, because the demo will be repeated multiple times, we will naturally need the option to reset all variables to their initial value.

wine

description

For the demo, there will be three states for the wine bottle: wine rack storage (tilted at an angle); taken out and put (standing upright) on the counter; and being shaken.

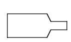
In the 'real world' the relationship of quality to price is quite complicated (and happens over many years) - wine's quality will only ever increase, even if it is being mistreated, because it is still aging. However, for the sake of illustration in the demo, we will simplify this and will just show that the price of the wine decreases depending on its treatment (rather than trying to model a complex relationship of quality to price).

Thus, in the wine rack, the price of the wine increases gradually; when the wine bottle is standing, its price slowly decreases; when being shook up, the price rapidly decreases.

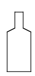
However, the price of wine will never equal zero, or in other words, go below a certain threshold A. As the price of wine decreases dramatically, it does so asymptotically (we suggest, but will check and confirm, that this implies being multiplied with a ($A+e^{-kt}$) function).

artifact state

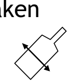
Lying down



Standing up



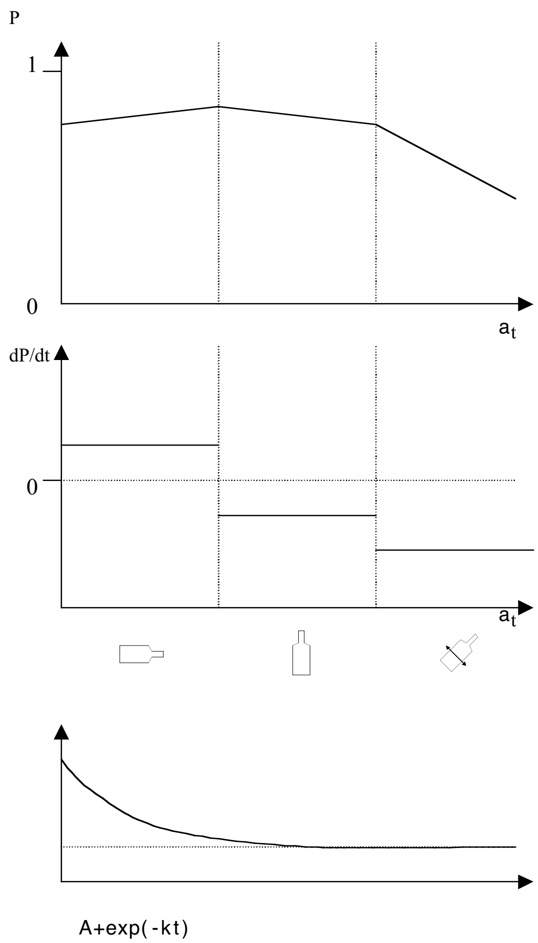
Being shaken



output
Price P=f (at) Œ [0, 1]

coefficient

Time coefficient	a
Quality derivative coefficient while lying down	b
Quality derivative coefficient while standing up	g
Quality derivative coefficient while shaken	h
Exponential coefficient	k
Decay threshold	A<1


P
1
0
a_t
dP/dt
0
a_t
A+exp(-kt)

cheese

description

The lifecycle of cheese is such that it takes some time to ripen and should be served at the peak of its ripeness, after being allowed to sit for a short time outside the fridge as its temperature rises to room temperature. This optimal state only occurs once - the second time it is served it is already starting to go off, and it should not be served (temperature brought to room temperature) more than once.

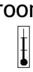
For the purpose of the demo, we will exaggerate the time of the cheese lifecycle, and describe it in two phases that comprise all the artifact states.

artifact state

Stored in the fridge

Taken out of the fridge

Reaching room temperature (ready to be served)



Phase 1 (Preparation for serving the first time):
While **stored in the fridge** - the quality of the quality stays the same. Some time before it has to be served, the cheese is **taken out of the fridge** until it **reaches room temperature**. During that time, its quality increases rapidly. Once room temperature is reached, the quality of the cheese is optimal. Afterwards, it decreases.

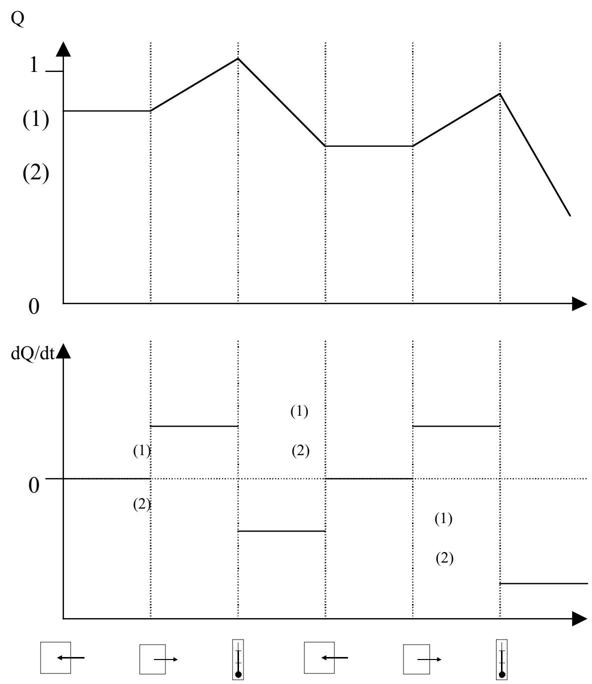
Phase 2 (Preparation for serving a second time):
The quality of the cheese stays the same while **in the fridge**, although its total value has decreased since phase 1. The quality rises again slightly when the cheese is **taken out of the fridge** but decreases even faster than at phase 1 after **room temperature** is reached (because the cheese has now gone bad).

Note: We will be experimenting with ways of demonstrating the changes in cheese temperature for the Jamboree. In order to exaggerate 'reaching room temperature', we might imagine measuring the external temperature instead of the internal cheese temperature. This is to be experimented with and determined later.

output
Quality Q=f (at) Œ [0, 1]

coefficient

Time coefficient	a
Quality derivative coefficients while in the fridge	b_1, b_2
Quality derivative coefficients while warming up	g_1, g_2
Quality derivative coefficients after reaching room temperature	h_1, h_2


Q
1
(1)
(2)
0
dQ/dt
(1)
(2)
0
(1)
(2)
(1)
(2)

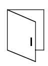
oysters

description

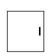
From the moment the oysters are taken from the sea, their quality only decreases. This decay is slower when stored properly in the fridge. In the demo, we will illustrate that their quality worsens with fluctuations in temperature, in the situation of the fridge door being opened and closed. Each time the fridge is opened, the quality of the oysters decays drastically. The decay gets slower when the door is closed again.

input actions

Fridge open



Fridge closed



output
Quality Q=f (at) Œ [0, 1]

coefficient

Time coefficient	a
Quality derivative coefficient while fridge open	b
Quality derivative coefficient while fridge closed	g