The idea behind **situation calculus** is that (reachable) states are definable in terms of the actions required to reach them. These reachable states are called situations. What is true in a situation can be defined in terms of relations with the situation as an argument. Situation calculus can be seen as a relational version of the feature-based representation of actions.

Here we only consider single agents, a fully observable environment, and deterministic actions.

Situation calculus is defined in terms of situations. A **situation** is either :

init, the initial situation, or
do(A,S), the situation resulting from doing action *A* in situation *S*, if it is possible to do action *A* in situation *S*.

Example a: Consider the robot delivery domain and the task of finding a path from one location to another . This can be modeled as a state-space search problem, where the states are locations.

Example 1: Consider Example 3.1. Suppose in the initial situation, init, the robot, Rob, is at location o109 and there is a key k1 at the mail room and a package at storage.

do(move(rob,o109,o103), init)

is the situation resulting from Rob moving from position o109 in situation init to position o103. In this situation, Rob is at o103, the key k1 is still at mail, and the package is at storage.
The situation

```
do(move(rob,o103,mail),
  do(move(rob,o109,o103),init))
```

is one in which the robot has moved from position o109 to o103 to mail and is currently at mail. Suppose Rob then picks up the key, k1. The resulting situation is

```
do(pickup(rob,k1),
   do(move(rob,o103,mail),
      do(move(rob,o109,o103),init))).
```

In this situation, Rob is at position mail carrying the key k1.

A situation can be associated with a state. There are two main differences between situations and states:

- Multiple situations may refer to the same state if multiple sequences of actions lead to the same state. That is, equality between situations is not the same as equality between states.
- Not all states have corresponding situations. A state is **reachable** if a sequence of actions exists that can reach that state from the initial state. States that are not reachable do not have a corresponding situation.

Some *do(A,S)* terms do not correspond to any state. However, sometimes an agent must reason about such a (potential) situation without knowing if A is possible in state S, or if S is possible.