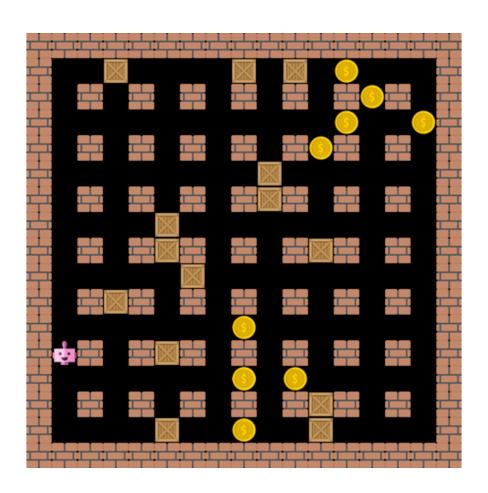
FUNDAMENTALS OF MACHINE LEARNING

FINAL PROJECT - REPORT

Reinforcement Learning for Bomberman

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Feature Design

1.1 Simple features

by Mika Rother

To see how many features there are, we designed a function that creates a dummy state and returns the number of features.

```
def get_num_features():
      dummy_state = {
2
           'round': 0,
3
           'step': 0,
4
           'field': np.zeros((17, 17)),
5
           'bombs': [],
6
           'explosion_map': np.zeros((17, 17)),
           'coins': [],
           'self': ("dummy", 0, True, (1, 1)),
           'others': []
      }
      return state_to_features(dummy_state).shape[0]
```

This makes it easier to debug problems.

1.2 Advanced features

by Mika Rother

1.2.1 Shortest path algorithms

Now we needed a shortest path algorithm, so the agent tries to find the nearest coin or crate. First we had to think about a data structure that can handle an A^* search efficiently. For this we needed a node structure, so we created the following class

```
class Node:

"""

This class is needed to perform an A* search

"""

def __init__(self, parent=None, position=None):

self.parent = parent
self.position = position
self.g = 0
self.h = 0
self.f = 0
```

```
def __eq__(self, other):
    return self.position == other.position

def __lt__(self, other):
    return self.g < other.g</pre>
```