Train barrier

1 Working principle

The system is based on the hybrid automaton models of a gate, controller and a train made by Thomas A. Henzinger in his work "*The Theory of Hybrid Automata*". Liberties have been taken with regard to the model. The differences will be discussed later on.

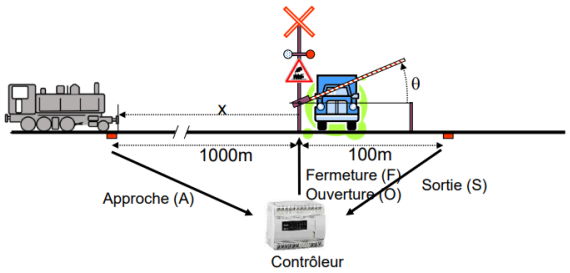

Figure 1: Schema of the system

Model is based on the communication between three different systems : the train, the controller and the barrier. The train communicate its position to the controller and when it is estimated that the train is near enough to the intersection, the controller will command the barrier to close. When the controller detect that the train has passed the intersection, it will command the barrier to reopen. Then the controller will communicate with another train and the cycle is repeated.

2 Model

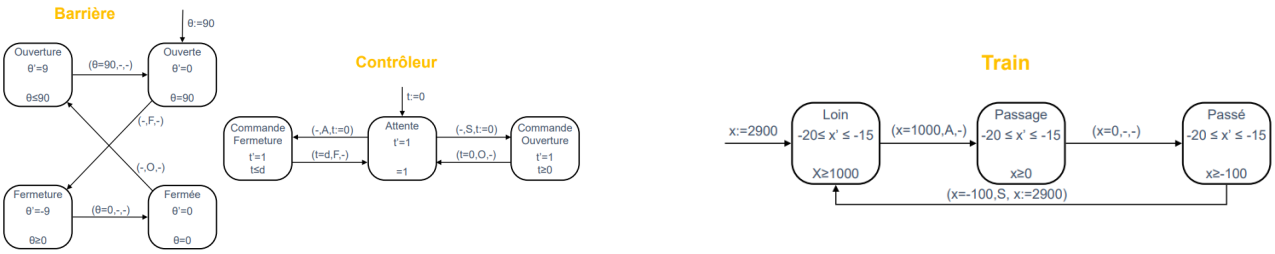

Figure 2: Example of a model of the controller and the train

The system is modeled by three automatons who are running in parallel. The automaton "Train" will generate a train whose speed is randomly generated. The locations of the automaton depend on the position of the train in comparison with the intersection. The locations of the automaton "Contrôleur" define the order to give to the barrier which will open or close depending on the position of the train. When the train is near the intersection, the automaton "Contrôleur" will be in the location "Commande Fermeture" which will impose the automaton "Barrière" to be in the state where the barrier will be undergoing closing. After the train has passed the intersection, the automaton "Contrôleur" will be in the location "Commande Ouverture" which will impose the automaton "Barrière"

to be in the state where the barrier is being opened. After the train is far enough, the automaton will generate a new train and reiterate the cycle.

In our model, the apparition of a train and its speed are randomized. Besides, the controller automaton have one supplementary location after the location "Commande Fermeture" whose the function is to impose on the gate to wait 2 sec after the train has passed the intersection, so as to be sure that the train is far enough before opening the gate. The opening/closing speed of the barrier is also considered to be constant.