Overview

The purpose of this exercise is to understand the relationship between active index and Petri nets. Both are tools for the modeling of distributed multimedia systems. Active index cells are added incrementally to build a dynamic index, and the connections can also change dynamically. However, if the messages passed between index cells are deterministically routed, then it is possible to convert active index into a Petri net. Otherwise you must use a Petri net with conditions (predicates) associated with the transitions, or an **Evaluation Net** (E-net).

a) Convert the active index you constructed in Exercise #2 into a Petri net (or an E-net).
b) Take the diagram you drew in part (c) of Exercise #2. Redraw it here (because you may want to make some changes), and now use the marked Petri net to illustrate the scenario. You can draw a sequence of marked Petri net to show how the system works.

**Scenario 1:** Two help gestures are detected by the gesture recognition cell and an ambulance is sent.

All of the cells start in their initial “waiting” state:

![Petri Net Diagram]

A gesture is detected by the gesture recognition cell:

![Petri Net Diagram]
A transition will occur and the system is ready to send a message on to the emergency manager cell. A token will be placed in the “message sent” in the next place:

![Diagram 1]

Another transition will occur and pass the message (token) on to the emergency manager. A token will be moved from the gesture recognition cell to the emergency manager as “message received”. A new token will be placed back into the “waiting for gesture” place of the gesture recognition cell. This means once the gesture recognition cell passes on the messages it will continue to wait for more gestures from the patient:

![Diagram 2]
A transition occurs and the message is marked as “1st message received”:

A second gesture is detected immediately after the first message was received:
The second gesture is transitioned to a second message:

The second message is then transitioned to the emergency manager as a received message, and a token is placed back into the “waiting for gesture” place of the gesture recognition cell:
There is now two tokens in the first and second message received, which means the emergency manager has to transition to creating and sending a “visit patient” message to be passed on to the homecare staff:

A transition occurs and a token is passed on to the “visit message sent” place and a token is placed back to the “waiting for messages” place.
A token is received by the homecare staff to visit the patient:

A transition occurs and an ambulance is sent to the patient:
The homecare staff then transition back to “waiting for alerts”, putting the system back into its initial state.

Scenario 2: A help gesture is detected and a phone call is successfully made to the patient.

All of the cells start in their initial “waiting” state:
A gesture is detected by the gesture recognition cell:

A transition will occur and the system is ready to send a message on to the emergency manager cell. A token will be placed in the “message sent” in the next place:
Another transition will occur and pass the message (token) on to the emergency manager. A token will be moved from the gesture recognition cell to the emergency manager as “message received”. A new token will be placed back into the “waiting for gesture” place of the gesture recognition cell. This means once the gesture recognition cell passes on the messages it will continue to wait for more gestures from the patient:

A transition occurs and the message is marked as “1st message received”:
A transition occurs and a token is passed on and a “call patient” message is created to be passed on to the homecare staff:

The call patient message is passed on to the homecare staff, and a token is placed back into “waiting for message” for emergency manager:
A transition occurs and a call is made to a patient:

A transition occurs and the patient answers the phone call:
The homecare staff then transition back to “waiting for alerts”, putting the system back into its initial state.

c) Suppose the emergency manager index cell corresponds to a **super-component**, i.e., the emergency manager can enumerate a number of feasible solutions and select the most appropriate one. Draw the personal health care system as a pair of (I-card, C-card), and convert it into an ordinary Petri net. (To do that, you need to assume a specific number of feasible solutions for the emergency manager to evaluate. Let us say three.)