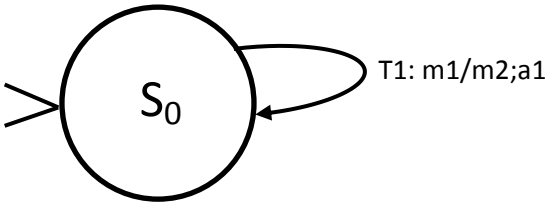
CS2310 Exercise 2

Wen-Chyi Lin

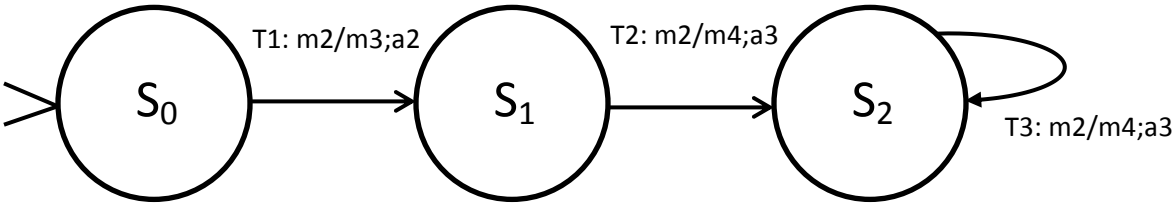
wel69@pitt.edu

(a) Draw state-transition diagrams to define graphically the three index cell types.

- Gesture recognition index cell
  - m1: I need help
  - m2: Patient Smith needs help
  - s0: Monitoring gesture
  - a1: Send m2 to emergency manager index cell

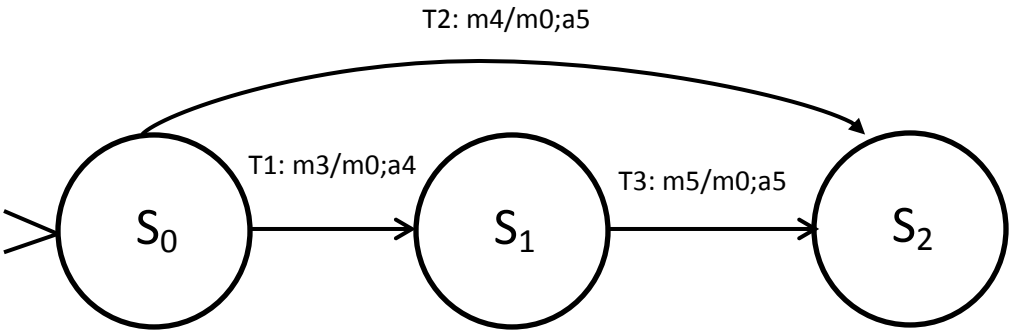


- Emergency manager index cell
  - m2: Patient Smith needs help
  - m3: Call patient Smith
  - m4: Visit patient Smith
  - s0: Waiting for message (idle)
  - s1: Urgent situation
  - s2: Immediate emergence (life threatening)
  - a2: send m3 to the homecare staff cell
  - a3: send m4 to the homecare staff cell



◆ Homecare staff index cell

- m0: null (no message generated)
- m3: Call patient Smith
- m4: Visit patient Smith
- m5: Mr. Smith doesn't answer the phone
- s0: Waiting for message (idle)
- s1: Urgent situation
- s2: Immediate emergence (life threatening)
- a4: Call Mr. Smith
- a5: Visit Mr. Smith with ambulance



(b) Specify the three index cell types formally using mathematical notations ic = (X, Y, S, s_o, A, t_{max}, f, g),

- gsReg_ic = gesture recognition index cell
- erMngr_ic = emergency manager index cell
- hcSf_ic = homecare staff index cell

gestRec_ic = (

X = { m0, m1 }, where m0= dummy(idle), m1 = I need help
Y = { m0, m2 }, where m0= dummy(idle), m2 = Patient Smith needs help
S = {s0}, where s0 = monitoring gesture
A = {a0, a1}, where a0=null, a1 = send m2 to erMngr_ic
tmax = infinity
f := f(x={ m0, m1 }, s0) → {1},
f({m0}, s0) = 1,
f({m1}, s0) = 1
g := g(m1,s0) = (erMngr_ic, m2, s0, a1),
g(m0,s0) = (gestRec_ic, m0, s0, a0)

erMngr_ic = (

X = {m0, m2}, where m0 = null, m2 = Patient Smith needs help

Y = {m0, m3, m4}, where m0=null, m3 = Call patient Smith, m4 = Visit patient Smith

S = {s0, s1, s2}, where s0 = waiting for gesture (idle), s1= Urgent situation, s2= Immediate emergence

A = {a0, a2, a3}, where a0 = null, a2 = send m3 to the hcSf_ic, a3 = send m4 to the hcSf_ic

t_{max} = infinity

f := f({m2}, s0)= 1,
f({m2}, s1)= 1,
f({m2}, s2)= 1,
f({m0}, s0)= 1

g := g(m2,s0) = (hcSf_ic, m3, s1, a2)
g(m2,s1) = (hcSf_ic, m4, s2, a3)
g(m2,s2) = (hcSf_ic, m4, s2, a3)
g(m0,s0) = (erMnge_ic, m0, s0, a0)

hcSf_ic = (

X = {m0, m3, m4, m5}, where m0 = null, m3 = call patient Smith, m4 = visit patient Smith, m5 = Mr. Smith doesn't pick up the phone

Y = {m0}, where m0 = null

S = {s0, s1, s2}, where s0 = waiting for message (idle), s1= Urgent situation, s2= Immediate emergence

A = {a0, a4, a5}, where a0 = null, a4 = call Mr. Smith, a5 = visit Mr. Smith with ambulance

t_{max} = infinity

f := f({m0}, s0)= 1,
f({m3}, s0)= 1,
f({m4}, s0)= 1,
f({m5}, s1)= 1

g := g(m0,s0) = (hcSf_ic, m0, s0, a0)
g(m3,s0) = (hcSf_ic, m0, s1, a4)
g(m4,s0) = (hcSf_ic, m0, s2, a5)
g(m5,s1) = (hcSf_ic, m0, s2, a5)

(c) Draw a diagram showing three multimedia interfaces (webpages such as doc-1, ..., doc-3) enhanced with the index cells to illustrate how these index cells work together to form an active index system.

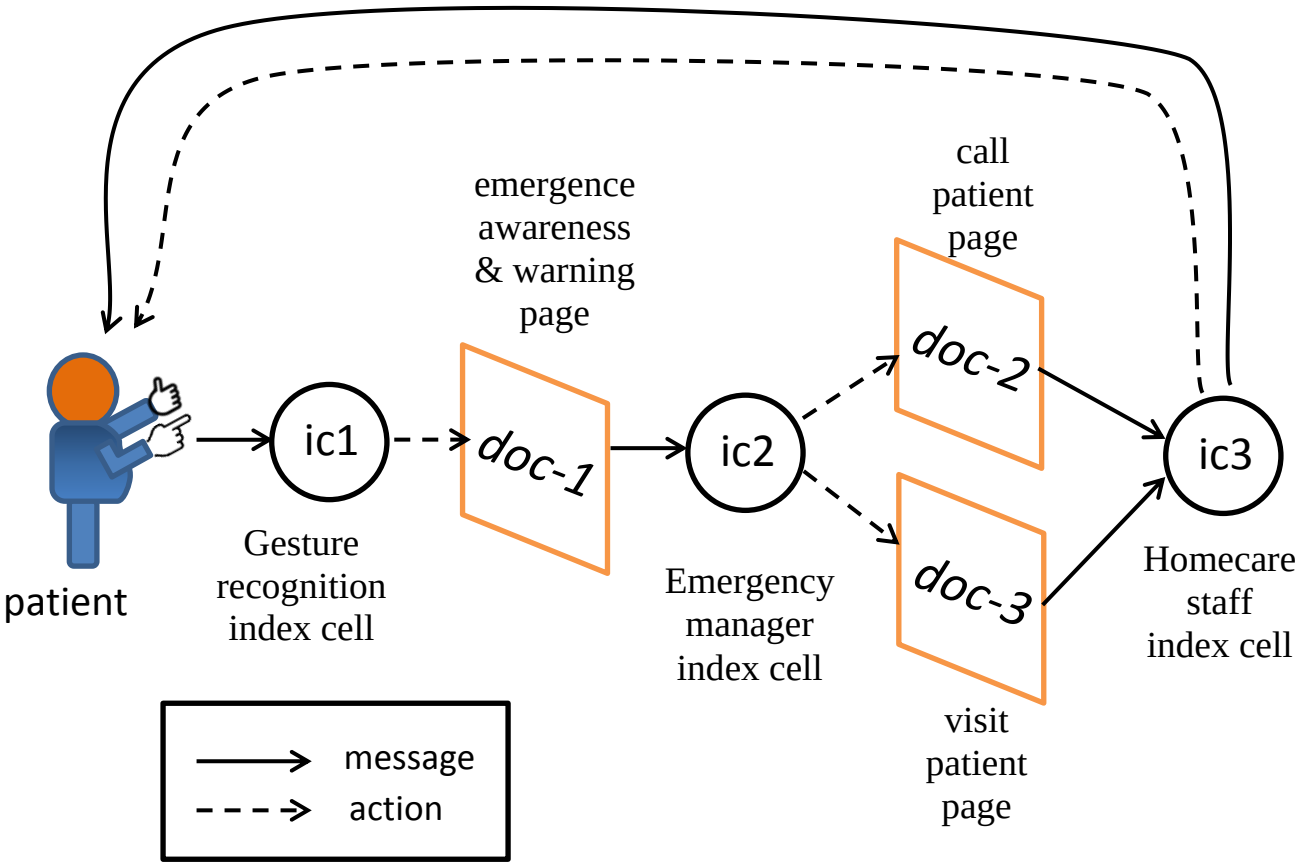


Fig: Active index system

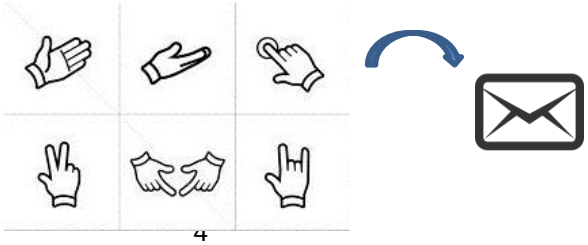
(d) Following the discussion on the concept of patterns, define more clearly the pattern(s) you have identified. If you feel the patterns you have identified are lacking in certain respect, you may replace them by some new patterns.

Pattern: Transformation (P, X, S)

Problem: The patient is not computer-literate

Context: Receive "I need help" message from the patient through the system

Solution: detect and recognize patient's hand gestures then generate "I need help" message to the system



Pattern: Decision (P, X, S)

Problem: The patient can't answer the phone or has lost consciousness

Context: Get patient's status and decide if the patient needs help

Solution: call the patient once a message is received and visit he/she if multiple messages are received (or the patient is not answering)

Pattern: RapidResponse (P, X, S)

Problem: The patient living alone at home is suffering and can't wait long

Context: Provide the personal health care for the patient in need

Solution: call the patient and/or visit the patient by ambulance right away

Pattern: Synchronization (P, X, S)

Problem: The patient is living at home alone and is not computer-literate

Context: Provide home care for the senior citizen

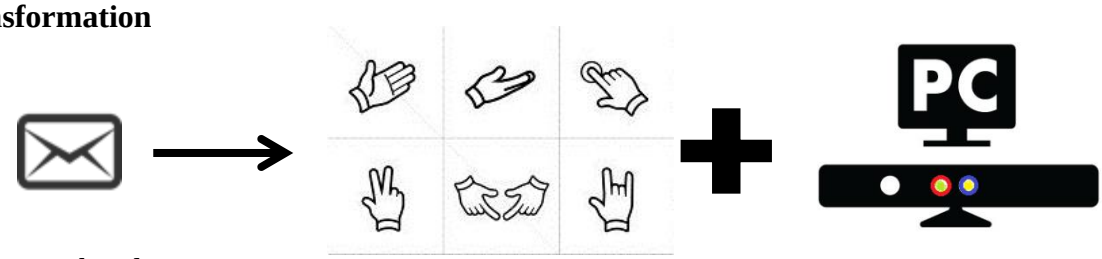
Solution: use an active index system to synchronize the patient's medical condition with the homecare staff

(e) A visual specification of the identified pattern(s) should be included, using for example visual grammar rules. Remember Alexander's dictum: "If you can't draw a picture of it, it isn't a pattern.")

Define G: a compiler generates sentences:

G = (N, X, OP, s, R), where N is the set of nonterminals, X is the set of terminals (icons), OP is the set of spatial relational operators, s is the start symbol, and R is the set of production rules

- **Transformation**

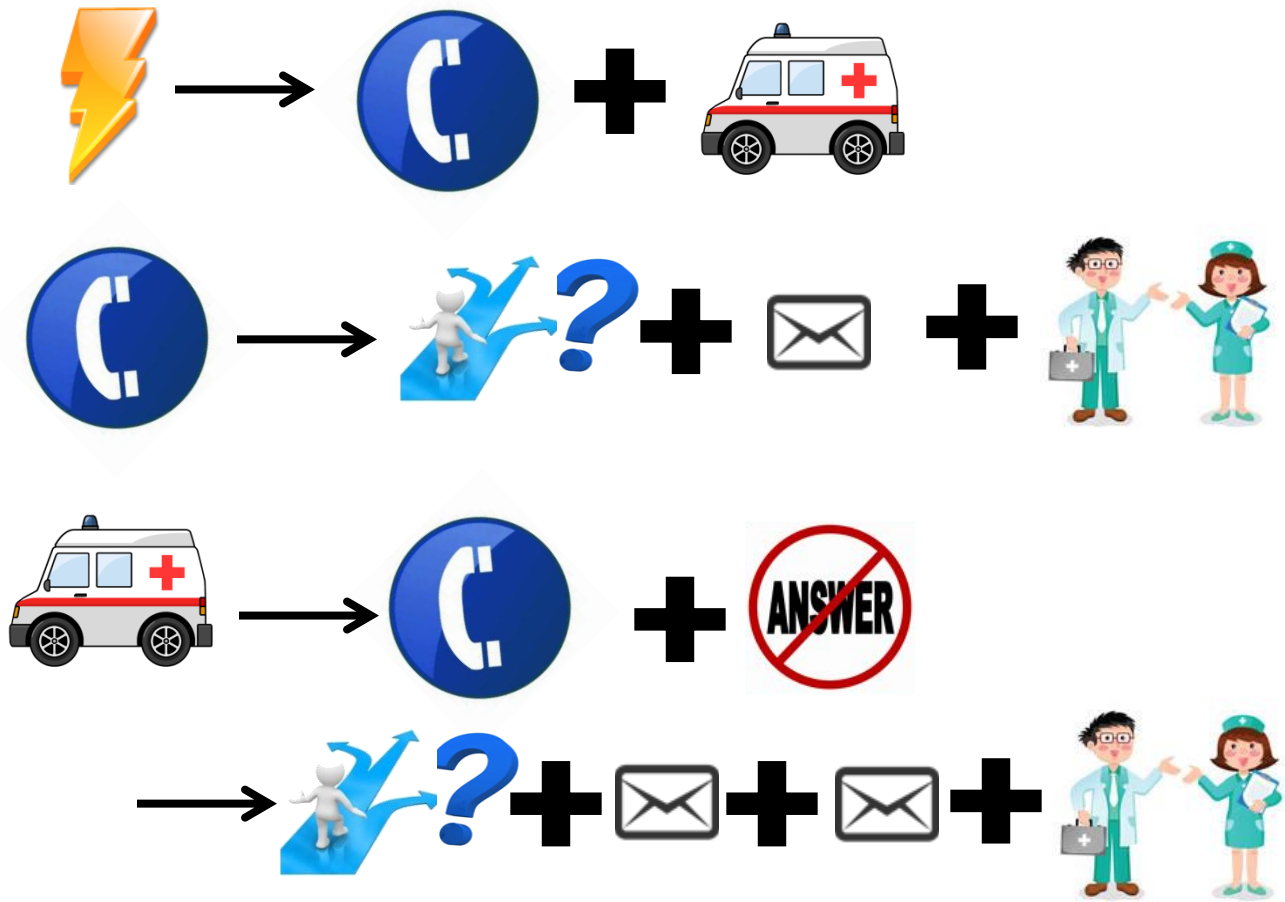


Message = hand gestures + gesture recognition

- **Decision**

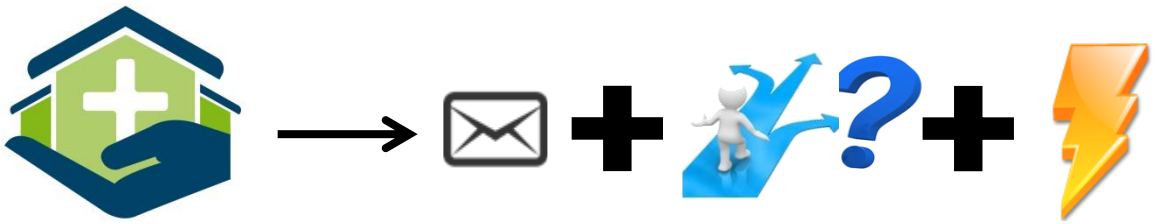
Decision = message + message

- **RapidResponse**



RaipdResponse = Phone call + Ambulance visit
Phone call = Decision + Message + Homecare staff
Ambulance visit = Phone call + No answer from the patient
= Decision + Message + Homecare staff + No answer from the patient
= Decision + Message + Message + Homecare staff

- Synchronization



Synchronization = message + decision + rapidresponse