# AUTOMI (FSM)-Esercizi

Prof. Fischetti Pietro

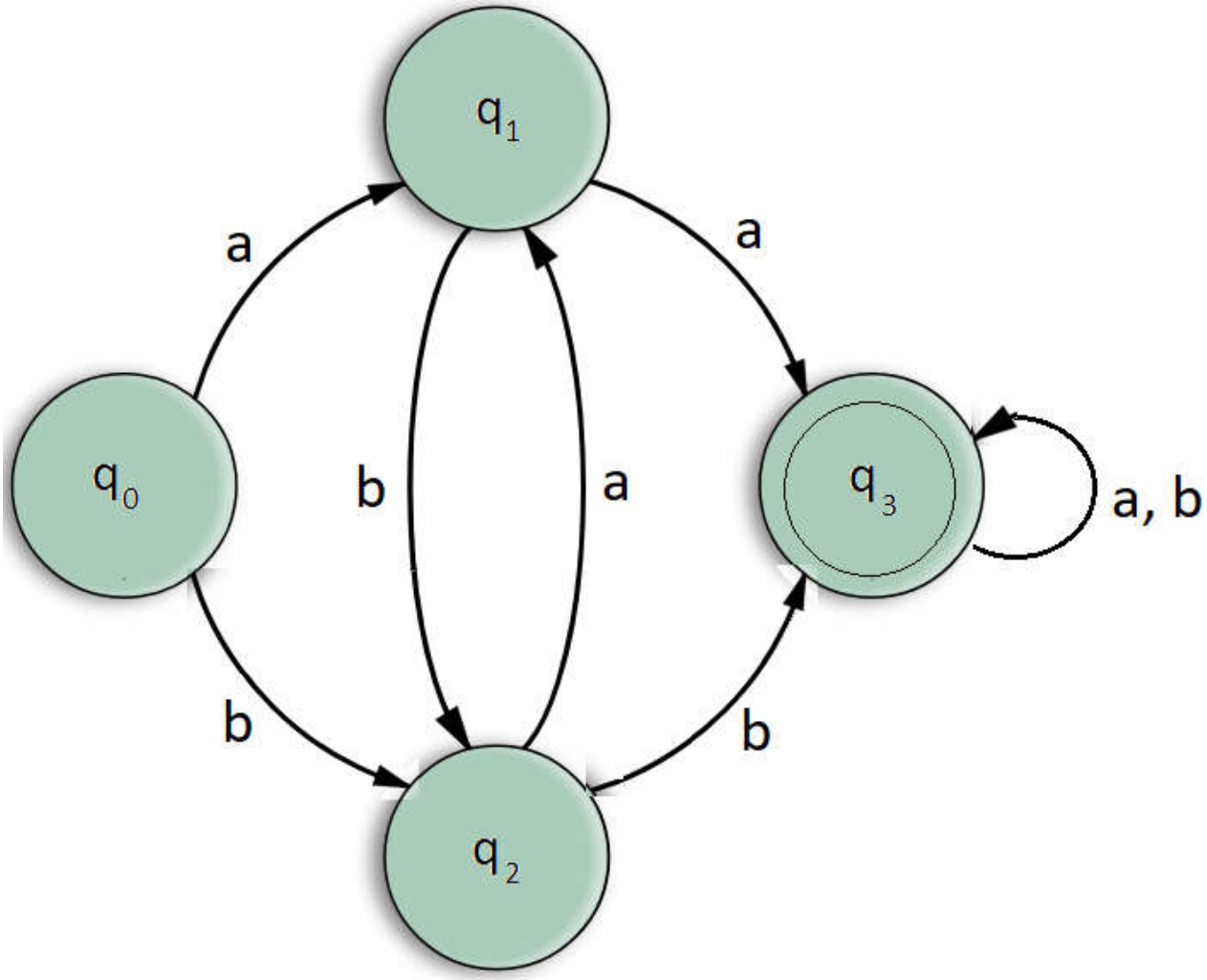
ESEMPIO 1:

Realizzare un automa che riconosca tutte e sole le stringhe costituite da due ‘a’ oppure da due ‘b’ consecutivi:

es. valido: aab, babb, aaa,...

es. non valido: ab, a, babab,...

Soluzione ($q_0$ - stato iniziale):

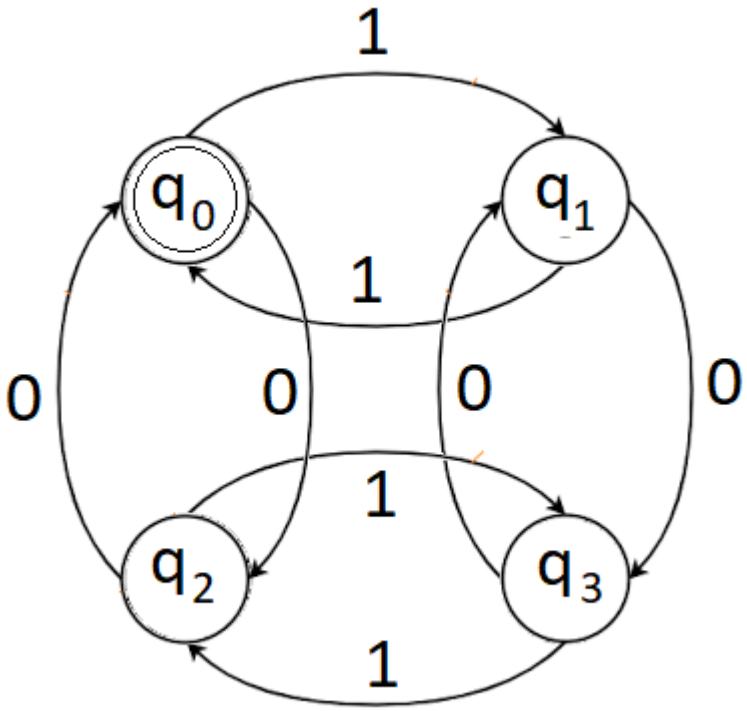


ESEMPIO 2:

Riconoscere tutte e sole le stringhe costituite da un numero

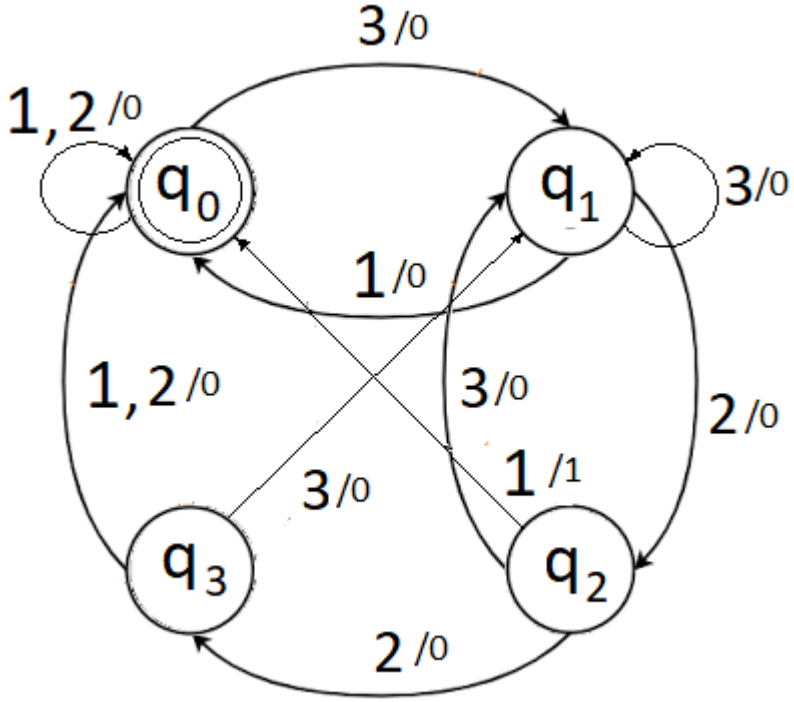
pari di 0 e da un numero pari di 1, come ad esempio 1001, 10100011.

Soluzione ($q_0$ - stato iniziale):



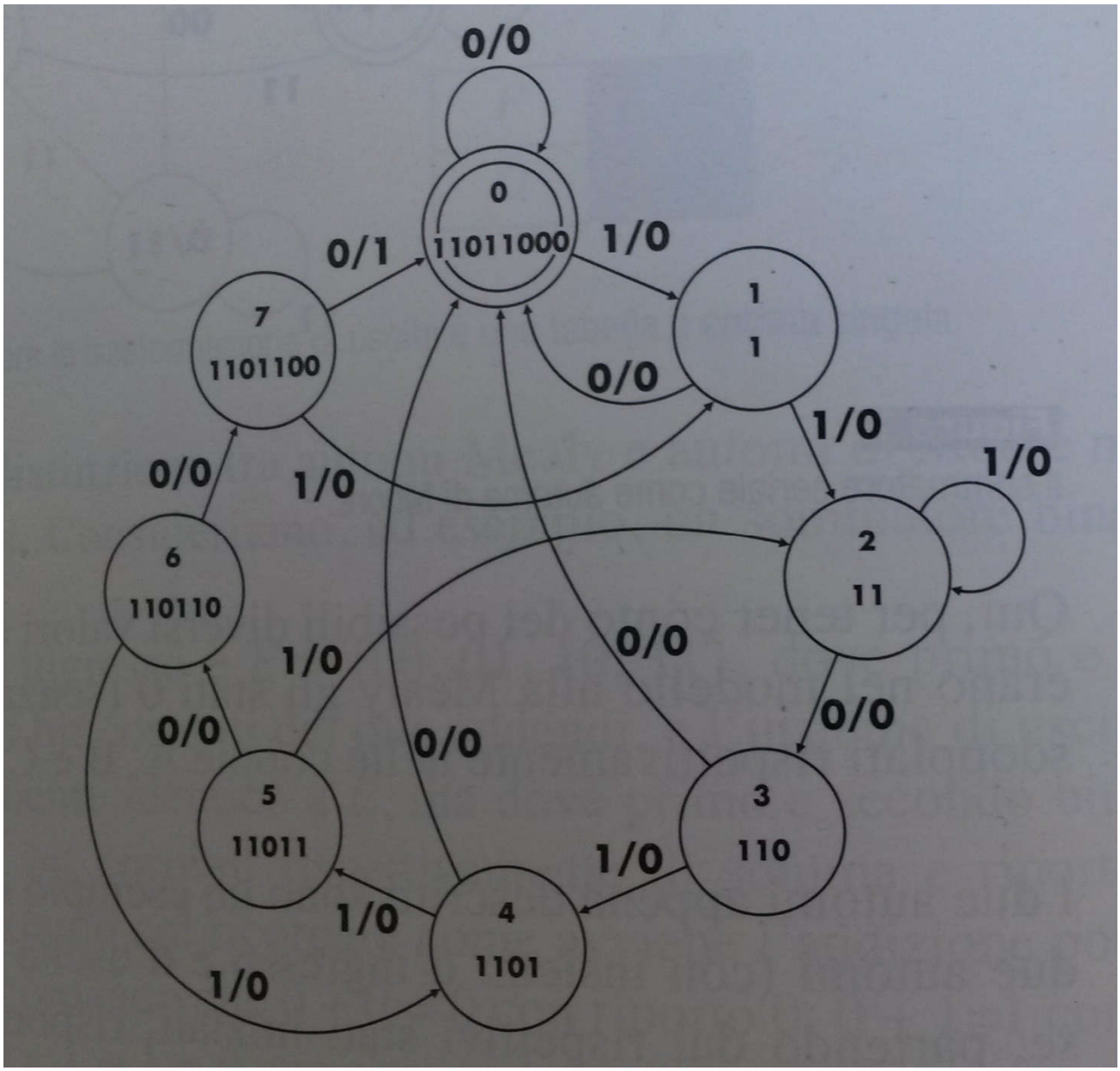
ESEMPIO 3:

Dati i simboli di input:1,2,3 riconoscere la sequenza ‘321’.




ESEMPIO 4:

Riconoscere la sequenza:1101000




Realizzazione in Python: FSM.py

```
import json

class event:
    data=""
    n=""
    def __init__(self,d,n,out=None):
        self.data=d
        self.n=n
        self.out=out
    def __repr__(self):
        return self.data + '->' + self.n + ' (' + self.out + ') '
class state:
    name=""
    events=[]
    def __init__(self,automa):
        self.automa=automa
```

```
    def toJSON(self):
        return json.dumps(self, default=lambda o: o.__dict__,
            sort_keys=True, indent=4)
    def fromJSON(self,d):
        self.events=[]
        self.name=d["name"]
        for element in d['events']:
            self.events+=[event(element["data"],element["n"],element["out"])]
    def __repr__(self):
        s=""
        for e in self.events:
            s+=str(e)
        return self.name + ': ' + s + " "
    def getStateByName(self,name):
        i=0
        for s in self.automa.states:
            if s.name == name:
                return self.automa.states[i]
            i+=1
        return None
    def switch(self,data):
        for s in self.automa.state.events:
            if s.data == data:
                print self.automa.state.name,':',data,
                self.automa.state=self.getStateByName(s.n)
                print '->',self.automa.state.name,'(',s.out,')'
                return
        raise Exception('Unknown Symbol: ' + data )

class automa:
    states=[]
    state=None
    def __init__(self,jsonDict):
        for item in jsonDict:
            x = state(self)
            x.fromJSON(item)
            self.states+=[x]
        self.state=self.states[0]
    def switch(self,data):
        self.state.switch(data)

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#riconoscere tutte e sole le stringhe costituite da 2a oppure da 2b consecutivi:
#es valida: aab, babb, aaa,...
#non valido: ab, a, babab,...
FSM_MAP1="""[
        {'name':'q0',
        'events':[
            {'data':'a','n':'q1','out':'0'},
            {'data':'b','n':'q2','out':'0'}
            ]
        },
        {'name':'q1',
```

```
        'events':[
          {'data':'a','n':'q3','out':'1'},
          {'data':'b','n':'q2','out':'0'}
          ]
        },
        {'name':'q2',
        'events':[
          {'data':'a','n':'q1','out':'0'},
          {'data':'b','n':'q3','out':'1'}
          ]
        },
        {'name':'q3',
        'events':[
          {'data':'a','n':'q3','out':'0'},
          {'data':'b','n':'q3','out':'0'}
          ]
        }
        ]"""

#Pag.269
#riconoscere tutte e sole le stringhe costituite da un numero
#pari di 0 e da un numero pari di 1, come ad esempio 1001, 10100011.
FSM_MAP2="""[
        {'name':'q0',
        'events':[
          {'data':'1','n':'q1','out':'0'},
          {'data':'0','n':'q2','out':'0'}
          ]
        },
        {'name':'q1',
        'events':[
          {'data':'0','n':'q3','out':'0'},
          {'data':'1','n':'q0','out':'1'}
          ]
        },
        {'name':'q2',
        'events':[
          {'data':'0','n':'q0','out':'1'},
          {'data':'1','n':'q3','out':'0'}
          ]
        },
        {'name':'q3',
        'events':[
          {'data':'0','n':'q1','out':'0'},
          {'data':'1','n':'q2','out':'0'}
          ]
        }
        ]"""

FSM_MAP3="""[
        {'name':'q0',
        'events':[
          {'data':'3','n':'q1','out':'0'},
```

```
        {'data':'2','n':'q0','out':'0'},
        {'data':'1','n':'q0','out':'0'}
        ]
    },
    {'name':'q1',
    'events':[
        {'data':'1','n':'q0','out':'0'},
        {'data':'2','n':'q2','out':'0'},
        {'data':'3','n':'q1','out':'0'}
        ]
    },
    {'name':'q2',
    'events':[
        {'data':'3','n':'q1','out':'0'},
        {'data':'2','n':'q3','out':'0'},
        {'data':'1','n':'q0','out':'1'}
        ]
    },
    {'name':'q3',
    'events':[
        {'data':'1','n':'q0','out':'0'},
        {'data':'2','n':'q0','out':'0'},
        {'data':'3','n':'q1','out':'0'}
        ]
    }
    ]"""
#mealy
FSM_MAP4="""[
    {'name':'q0',
    'events':[
        {'data':'0','n':'q0','out':'0'},
        {'data':'1','n':'q1','out':'0'}
        ]
    },
    {'name':'q1',
    'events':[
        {'data':'0','n':'q0','out':'0'},
        {'data':'1','n':'q2','out':'0'}
        ]
    },
    {'name':'q2',
    'events':[
        {'data':'0','n':'q3','out':'0'},
        {'data':'1','n':'q2','out':'0'}
        ]
    },
    {'name':'q3',
    'events':[
        {'data':'0','n':'q0','out':'0'},
        {'data':'1','n':'q4','out':'0'}
        ]
    },
    {'name':'q4',
```

```
      'events':[
         {'data':'0','n':'q0','out':'0'},
         {'data':'1','n':'q5','out':'0'}
         ]
      },
      {'name':'q5',
      'events':[
         {'data':'0','n':'q6','out':'0'},
         {'data':'1','n':'q2','out':'0'}
         ]
      },
      {'name':'q6',
      'events':[
         {'data':'0','n':'q7','out':'0'},
         {'data':'1','n':'q4','out':'0'}
         ]
      },
      {'name':'q7',
      'events':[
         {'data':'0','n':'q0','out':'1'},
         {'data':'1','n':'q1','out':'0'}
         ]
      }2
      ]"""

####json_acceptable_string = FSM_MAP1.replace("'", "\"")
####stringa="babbab"
####json_acceptable_string = FSM_MAP2.replace("'", "\"")
####stringa="10100011"
####json_acceptable_string = FSM_MAP3.replace("'", "\"")
####stringa="132113321312332122221132132321313221321111"
json_acceptable_string = FSM_MAP4.replace("'", "\"")
stringa="11011000”

d = json.loads(json_acceptable_string)
obj=automa(d)

for c in stringa:
   obj.switch(c)
```