Simulation Lab Report

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Single Queue With PYTHON

Sample Problem

A small grocery shop has one checkout counter.Customer arrrives at the checkout counter at random from 1 to 8 minutes apart. Each possible value of inter-arrival time has the same possibility of occurrence.The service time varies from 1 to 6 minutes with the possibility shown below.The problem is to analyze the system by simulating the arrival time and service time of 6 customers.

Informations:

- Service Time: [1,2,3,4,5,6]
- Probability: [0.10,0.20,0.30,0.25,0.10,0.05]
- Random Digit For Arrival: [913,727,15,948,304,922]
- Random Digit For Service Time: [84,10,74,53,17,79]

Python Code:

Codes for the distribution of Arrival Time Table:

DISTRIBUTION OF ARRIVAL TIME:

```
def DAT():
    print("Enter the time between Arrival\n")
    print("From: ")
    a=int(input())
    print("\nTo :")
    b=int(input())

    print("\nProbability of Occurance :",a/b)
    c=a/b
    print(c)
    import RDFA
    print("Time between Arrival "+"-Cumulative Probability "
    for x in range(a,b+1):
        print(x,"                ",c)
        c = c+(a/b)
    print("Random Digit:")
    RDFA.rdfa(c)
```

RANDOM DIGIT GENERATION FOR ARRIVAL TIME:

```
#RANDOM DIGIT FOR ARRIVAL TIME
global firstran
global secondran
def rdfa(p):
    global firstran
    global secondran
    a=[]
    b=1
    c=str(p)
    m=c[2:5]
    d= int(m)

    l=[]
    n=[]
    for x in range(0,1001):
        a.append(0+x)
    for x in a:
        x= a[b]
        l.append(int(b))
        y=a[d]
        n.append(int(d))
        print(x,'-',y)
        b=d+1
        d=d+125
        if(d>1000):
            break
    print(l)
    print(n)
    firstran = l
    secondran = n
```

Codes for the distribution of Service Time Table:

DISTRIBUTION OS SERVICE TIME

```
#Distribution of Service Time
def DOST():
    print("Enter Service Time
    print("From:")
    a=int(input())
    print("\nTO:")
    b=int(input())
    print("Service Time:")
    for x in range(a,b+1):
        print(x)
    import EPST
    EPST.EPST(a,b)
```

ENTER PROBABILITY FOR SERVICE TIME

```
#Enter Probability for service time

def EPST(b,c):
    a=[]
    print("Enter Probability For Service Time: ")
    for x in range(b,c+1):
        a.append(input())
    import CPST
    print("probability: ")

    for x in a:
        print(x)
    print("Cumulative Probability:")
    CPST.CPST(a)
```

CUMULATIVE PROBABILITY FOR SERVICE TIME

```
#cumulative Probability for servic

def CPST(a):

    v=0
    x=0
    z=[]
    for y in a:

        x = x+float(a[v])
        print('%0.2f'%x)
        v += 1
        z.append('%0.2f'%x)
    import RDFS
    print("Random DIGIT:")
    RDFS.RDFS(z)
```

RANDOM DIGIT GENERATION FOR SERVICE TIME

```
#RANDOM DIGIT FOR SERVICE TIME
global firstrans
global secondrans
def RDFS(p):
    a=[]
    d=[]
    b=1
    v=0
    n=0
    s=[1]
    global firstrans
    global secondrans
    for x in p:
        c=str(p[n])
        m=c[2:4]
        d.append(int(m))
        n+=1


    for x in range(0,101):
        a.append(x)
    for x in a:
        x= a[b]
        y=a[int(d[v])]
        print(x,'-',y)
        b=d[v]+1

        v+=1
        if v>5:
            break
        s.append(b)
    print(d)
    print(s)
    firstrans = s
    secondrans = d
```

Codes for the Time Between Arrival Determination Table:

Time Between Arrival Determination

```
from RDFA import *
global cuss
global tbaa
def TBAD():
    global cuss
    global tbaa
    cus=[]
    rd=[]
    tba=[]
    print("Enter The Number Of Customers")
    a=int(input())
    for x in range(1,a+1):
        cus.append(x)

    print("Enter The Random Digits:")
    for x in range(1,a+1):
        rd.append(int(input()))

    h=0
    for x in cus:
        if int(rd[h])==0:
            tba.append(0)
        elif rd[h]>=int(firstran[0])and rd[h]<=int(secondran[0]):
            tba.append(1)
        elif rd[h]>=int(firstran[1])and rd[h]<=int(secondran[1]):
            tba.append(2)
        elif rd[h]>=int(firstran[2])and rd[h]<=int(secondran[2]):
            tba.append(3)
        elif rd[h]>=int(firstran[3])and rd[h]<=int(secondran[3]):
            tba.append(4)
        elif rd[h]>=int(firstran[4])and rd[h]<=int(secondran[4]):
            tba.append(5)
        elif rd[h]>=int(firstran[5])and rd[h]<=int(secondran[5]):
            tba.append(6)
        elif rd[h]>=int(firstran[6])and rd[h]<=int(secondran[6]):
            tba.append(7)
        elif rd[h]>=int(firstran[7])and rd[h]<=int(secondran[7]):
            tba.append(8)
        h += 1
    print("CUSTOMER:")
    for x in cus:
        print(x)
    print("Random Digit:")
    for x in rd:
        print(x)
    print("Time Between Arrival")
    for x in tba:
        print(x)
    cuss = cus
    tbaa = tba
```

Codes for the Service Time Table:

Service Time

```
#Service Time
from RDFS import *
from TBAD import *
global stt
def ST():
    global stt
    rds=[]
    st=[]
    print("Enter the Random digit for service Time:")
    for x in cuss:
        rds.append(int(input()))
    h=0
    for x in cuss:
        if int(rds[h])==0:
            st.append(0)
        elif rds[h]>=int(firstrans[0])and rds[h]<=int(secondrans[0]):
            st.append(1)
        elif rds[h]>=int(firstrans[1])and rds[h]<=int(secondrans[1]):
            st.append(2)
        elif rds[h]>=int(firstrans[2])and rds[h]<=int(secondrans[2]):
            st.append(3)
        elif rds[h]>=int(firstrans[3])and rds[h]<=int(secondrans[3]):
            st.append(4)
        elif rds[h]>=int(firstrans[4])and rds[h]<=int(secondrans[4]):
            st.append(5)
        elif rds[h]>=int(firstrans[5])and rds[h]<=int(secondrans[5]):
            st.append(6)
        elif rds[h]>=int(firstrans[6])and rds[h]<=int(secondrans[6]):
            st.append(7)
        elif rds[h]>=int(firstrans[7])and rds[h]<=int(secondrans[7]):
            st.append(8)
        h += 1
    print("Customers:")
    for x in cuss:
        print(x)
    print("Random Digit for service Time:")
    for x in rds:
        print(x)
    print("Service Time:")
    for x in st:
        print(x)
    stt = st
```

Codes for the Final Table:

Final Table

```
#final Table
from TBAD import *
from ST import *
def FINAL():

    sbt=[]
    sett=[]
    wt = []
    tis=[]

    print("Customer Number:")
    for x in cuss:
        print(x)
    print("Intra Arrival Time:")
    for x in tbaa:
        print(x)
    print("Arrival Time:")
    v=0
    x=0
    g=0
    p=0
    at=[]

    for y in cuss:
        x = x+(tbaa[v])
        at.append(x)
        v += 1
    for x in at:
        print(x)

    h=0

    for x in at:
        if at[h]==0:
            sbt.append(at[h])
            sett.append(sbt[h]+stt[h])
        elif at[h]<sett[h-1]:
            sbt.append(sett[h-1])
            sett.append(sbt[h]+stt[h])
        elif at[h]>sett[h-1]:
            sbt.append(at[h])
            sett.append(sbt[h]+stt[h])
        elif at[h]==sett[h-1]:
            sbt.append(at[h])
            sett.append(sbt[h]+stt[h])
        h += 1

print("Service Beginning Time:")
for x in sbt:
    print(x)
print("Service Time:")
for x in stt:
    print(x)
print("Service Ending Time:")
for x in sett:
    print(x)
print("Waiting Time:")
for x in cuss:
    if sbt[g]>at[g]:
        wt.append(sbt[g]-at[g])
    elif sbt[g]==at[g] or sbt[g]<at[g]:
        wt.append(0)
    g += 1

for x in wt:
    print(x)

print("Time in System:")
for x in cuss:
    tis.append(stt[p]+wt[p])
    p += 1
for x in tis:
    print(x)
```

Main Segment:

```
print("Single Queue Simulation With Python")



import DOAT
print("\n\nDistribution of arrival time TABLE")
DOAT.DAT()
import DOST
print("\n\nDistribution of service time TABLE")
DOST.DOST()
import TBAD
print("\n\nTime Between Arrival Distribution")
TBAD.TBAD()
import ST
print("\n\nService Time")
ST.ST()
import FINAL
print("\n\n Final Table:")
FINAL.FINAL()
print("\n\nEnd Of The Simulation")
```

User Manual

MAIN = MAIN FILE

DOAT= DISTRIBUTION OF ARRIVAL TIME

RDFA = RANDOM DIGIT GENERATION FOR ARRIVAL TIME (CALLED IN DOAT)

DOST= DISTRIBUTION OS SERVICE TIME

EPST= ENTER PROBABILITY FOR SERVICE TIME (CALLED IN DOST)

CPST= CUMULATIVE PROBABILITY FOR SERVICE TIME (CALLED IN EPST)

RDFS= RANDOM DIGIT GENERATION FOR SERVICE TIME (CALLED IN CPST)

TBAD= TIME BETWEEN ARRIVAL DISTRIBUTION (CALLED IN MAIN) (LIST GENERATED FROM RDFA)

ST= SERVICE TIME (CALLED IN MAIN) (LIST GENERATED FROM RDFS AND RDFA)

FINAL= FINAL TABLE (CALLED IN MAIN)