

Programming STAUBLI TX90XL

Dr. Kurtuluř Erin Akdođan

kurtuluserinc@cankaya.edu.tr



ÇANKAYA ÜNİVERSİTESİ

MEKATRONİK MÜHENDİSLİĐİ BÖLÜMÜ

Applications: Structure

□ Variable types:

- **pointRx**: a point location in cartesian coordinates (p_1, p_2, p_3, \dots)
 - **jointRx**: a joint location in joint coordinates ($jStart$)
 - **tool**: a tool defined by the user ($tTool$)
 - **trsf**: a transformation ($trAApl$)
 - **mdesc**: motion descriptor ($mNomSpeed$)
-

Applications: Structure

□ Functions:

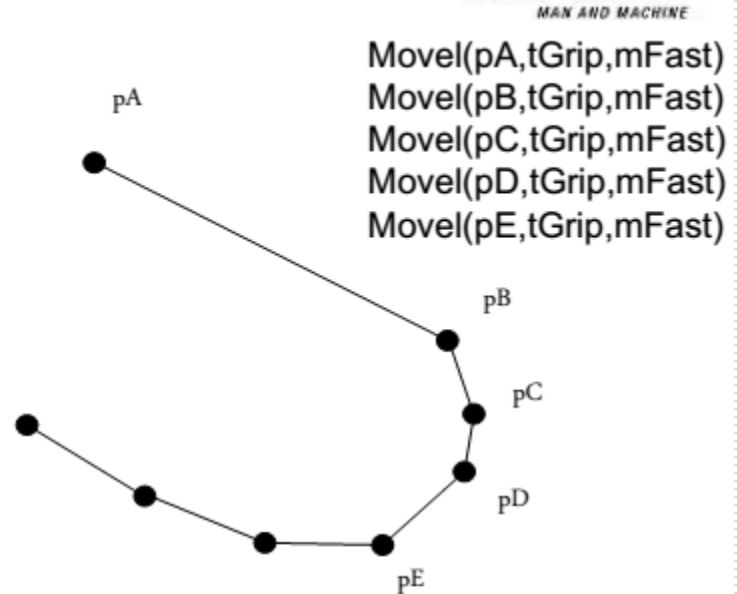
- `movej(joint, tool, mdesc)`: move to a (point or joint) coordinate with specified tool and motion descriptor
 - `movel(point, tool, mdesc)`: move linearly a point coordinate with specified tool and motion descriptor
 - `appro(point, trsf)`: calculate a transformed point by using a point and a transformation
 - `waitEndMove`: wait for the current movement to end.
-

Movement with movel

MOVEMENT : MOVEL

Movel(point,tool,mdesc)

Not available on JOINT



Cartesian Interpolation : straight line movement

Speed and acceleration described by motion descriptor

Problem of singularity crossing => slow down

Motion to use in case of constraint : obstacle, insertion, process,

...

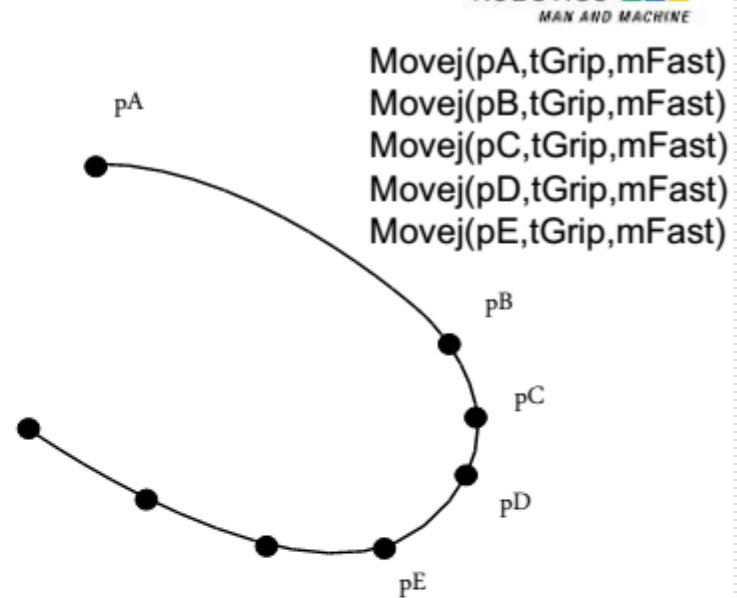
Movement with movej

MOVEMENT : MOVEJ

`Movej(point,tool,mdesc)`

or

`Movej(joint,tool,mdesc)`



Joint Interpolation : curved movement

Speed and acceleration described by motion descriptor

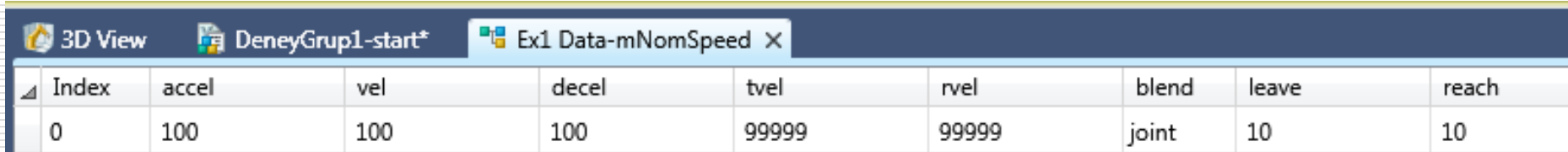
No problem of singularity crossing

Motion to use if no constraint : Obstacle, insertion, . . .

Editing mdesc

Right click on a variable and select 'Go to definition' to edit the variable. Edit only mdesc and trsf this way.

□ mdesc: mNomSpeed



The screenshot shows a software interface with three tabs: '3D View', 'DeneyGrup1-start*', and 'Ex1 Data-mNomSpeed X'. The 'Ex1 Data-mNomSpeed X' tab is active and displays a table with the following data:

Index	accel	vel	decel	tvel	rvel	blend	leave	reach
0	100	100	100	99999	99999	joint	10	10

Index	accel	vel	decel	tvel	rvel	blend	leave	reach
0	100	100	100	99999	99999	joint	10	10

10.5. MDESC TYPE

10.5.1. DEFINITION

The **mdesc** type is used to define the movement parameters (speed, acceleration, blending).

The **mdesc** type is a structured type, with the following fields, in this order:

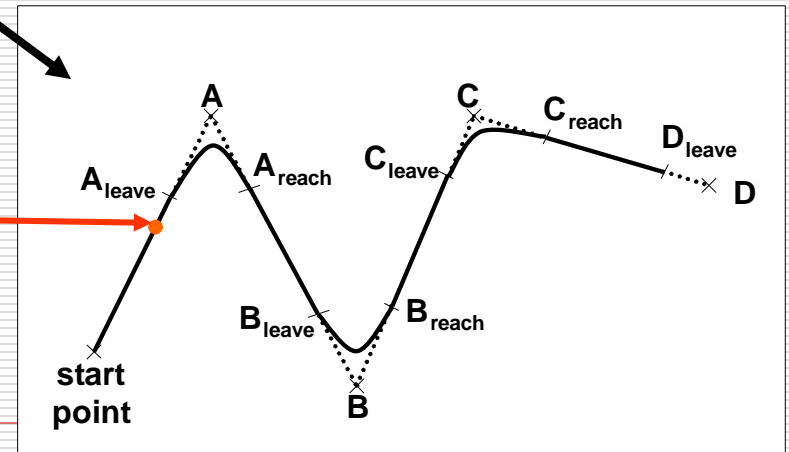
num accel	Maximum permitted joint acceleration as a % of the nominal acceleration of the robot.
num vel	Maximum permitted joint speed as a % of the nominal speed of the robot.
num decel	Maximum permitted joint deceleration as a % of the nominal deceleration of the robot.
num tvel	Maximum permitted translational speed of the tool center point, in mm/s or inches/s depending on the unit of length of the application.
num rvel	Maximum permitted rotational speed of the tool center point, in degrees per second.
blend blend	Blend mode: off (no blending), joint or Cartesian (blending).
num leave	In joint and Cartesian blend mode, distance between the target point at which blending starts and the next point, in mm or inches, depending on the unit of length of the application.
num reach	In joint and Cartesian blend mode, distance between the target point at which blending stops and the next point, in mm or inches, depending on the unit of length of the application.

MOTION DESCRIPTOR MDESC

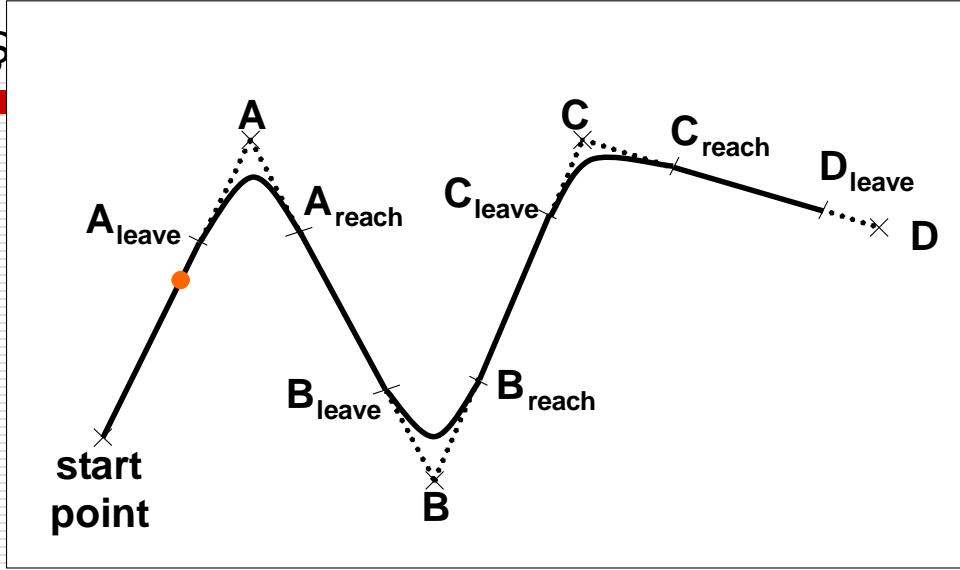
```
Application manager 100%
-Ual3 applications
-exercise3 (23 June 2004 15:23)
+Libraries
-Glo mSlow
+fl Vel (%) : 100
+wo
-jo Blend : Off
j
-md
mFast
mSlow
nom_speed
bool
>> Esc Ok
```

Vel : Eklem nominal hızına göre yüzde

- Yörüngenin Karıştırılması
- (Blending)
- kapalı : OFF
- açık : JOINT



YUMUŞ



```
modal data
l mFast
) Accel (%) : 100
) Vel (%) : 100
i Decel (%) : 100
n Tvel (mm/s) : 9999
) Rvel (deg/s) : 99999
) Blend : Off
i Leave (mm) : 50
t Reach (mm) : 50
i
```

- blending = joint ile aktifleştirilir*
- Mesafe ayarlanabilir*

■ *leave* : yörüngeyi bırakacağı mesafe [mm]

■ *reach* : yörüngeye ulaşacağı mesafe [mm]

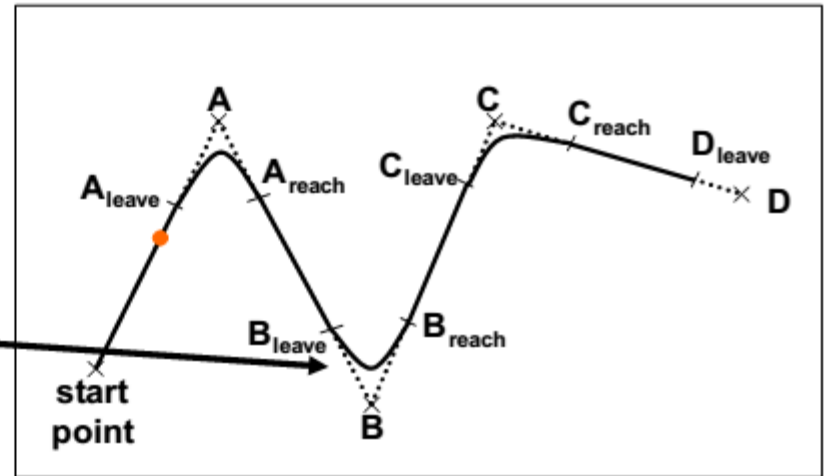
Motion descriptor parameters: blend

SMOOTHING : BLENDING

```
+flange
+world
+jo mFast
-md Speed (%) : 100
  m
  m Blend : Joint
bo
nu
string
aio
```

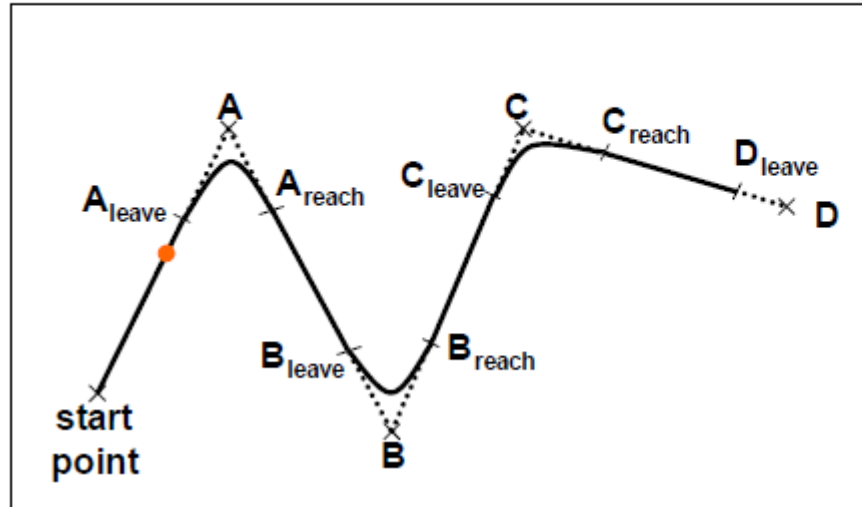
Vel : % of nominal speed of joints

No blending : OFF
Blending activated : JOINT



Index	accel	vel	decel	tvel	rvel	blend	leave	reach
0	100	100	100	99999	99999	joint	10	10

SMOOTHING : BLENDING



```

tool data
l mFast
o Accel (%) : 100
o Vel (%) : 100
d Decel (%) : 100
n Tvel (mm/s) : 9999
n Rvel (deg/s) : 99999
o Blend : Off
t Leave (mm) : 50
t Reach (mm) : 50
i
    
```

Activated with **blending = joint**

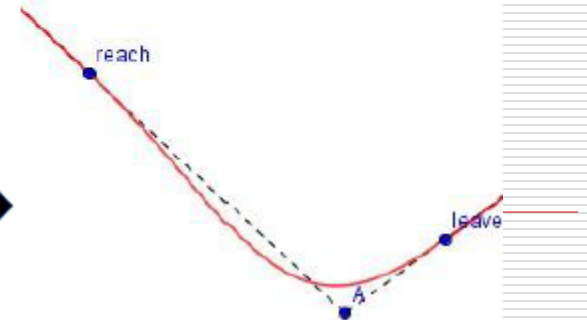
Distance can be customized :

leave : distance in mm where leave trajectory.

reach : distance in mm where reach trajectory.

•(V7+) Cartesian blending: **blend= cartesian**

!!!! Leave & reach with large difference →



MOVEC

```
movec(point pIntermediate, point pTarget,  
tool tTool, mdesc mDesc)
```

```
Movec (point, point, tool, mdesc)
```

□ In a circular movement, the tool center point moves through an arc defined by 3 points, and the tool orientation is interpolated between the initial orientation, the intermediate orientation, and the final orientation.

□ Dairesel interpolasyon

□ MDESC defines blending at the end of arc

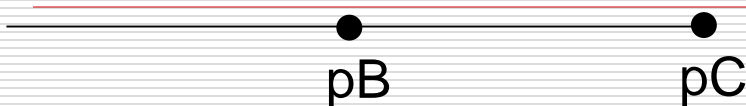
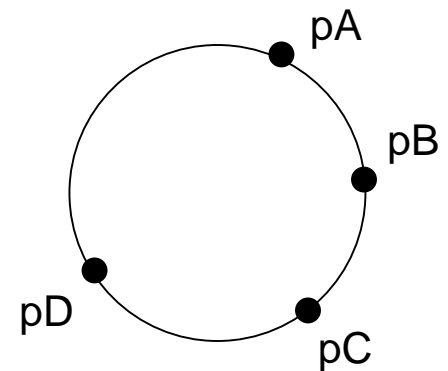
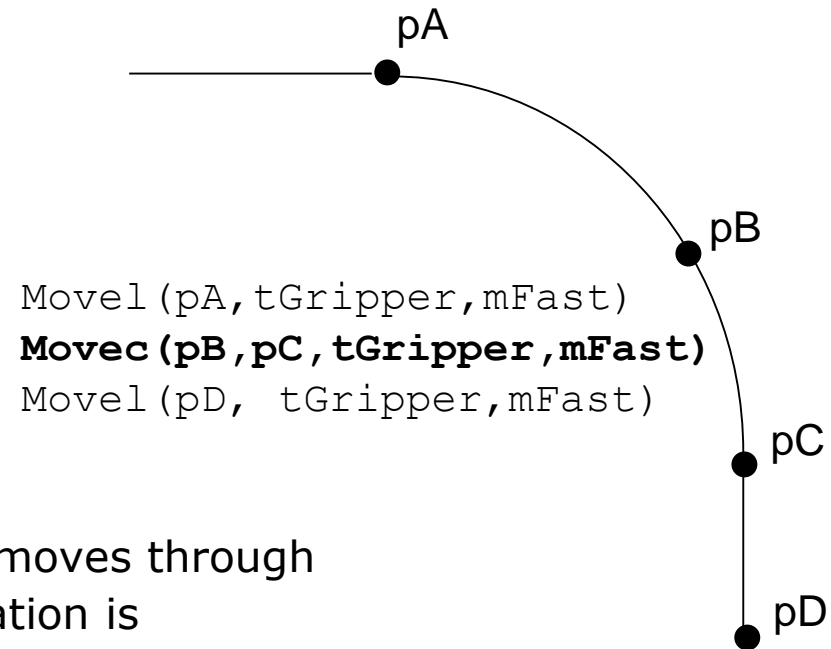
□ Circle is drawn with four points.

```
movec (pB, pC, tGripper, mFast)
```

```
movec (pD, pA, tGripper, mFast)
```

□ Straight line is possible:

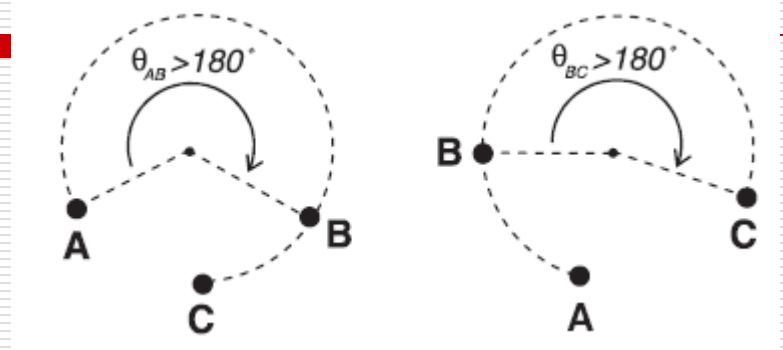
```
movec (pB, pC, tGripper, mFast)
```



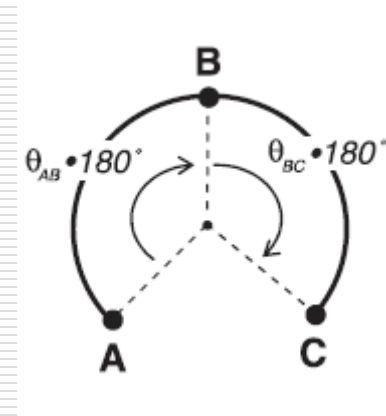
MOVEC : KARAKTERİSTİK

Mümkün olmayan hareketler

(birden fazla çözüm)???



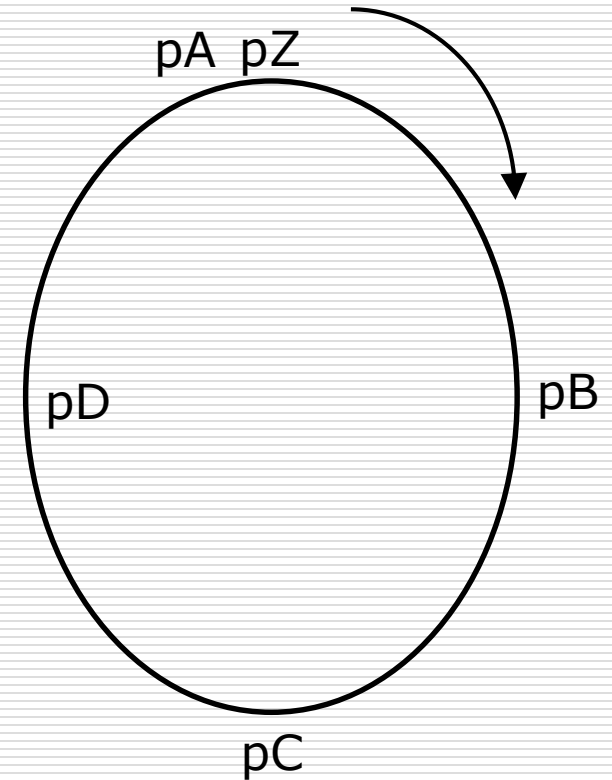
- Ara nokta-başlangıç nokta ve Ara nokta-bitiş noktası açıları 180 den küçük olmalıdır.



Detaylar için VAL3 Reference Manual'e bakınız.

Program: Drawing a Circle

```
1 begin
2   movej (jStart, tTool, mNomSpeed)
3   movej (pZ, tTool, mNomSpeed)
4   movec (pB, pC, tTool, mNomSpeed)
5   movec (pD, pA, tTool, mNomSpeed)
6   movej (jStart, tTool, mNomSpeed)
7   waitEndMove ()
8   delay (0)
9
10
11 end
```



Programming: Drawing Turkish Flag

```
1 begin
2   putln("Hilal çiziliyor...")
3   //Hilal kısmı
4   movej (jStart, tTool, mNomSpeed)
5   movej (p0, tTool, mNomSpeed)
6   movec (p1, p1e, tTool, mNomSpeed)
7   movec (p2, p3, tTool, mNomSpeed)
8   movec (p4, p5, tTool, mNomSpeed)
9   movej (p6, tTool, mNomSpeed)
10  movec (p6e, p7, tTool, mNomSpeed)
11  movec (p8, p9, tTool, mNomSpeed)
12  movec (p10, p11, tTool, mNomSpeed)
13  movej (jStart, tTool, mNomSpeed)
14  //Yıldız Kısmı
15  putln("Yıldız çiziliyor...")
16  movej (py1, tTool, mNomSpeed1)
17  movel (py2, tTool, mNomSpeed1)
18  movel (py3, tTool, mNomSpeed1)
19  movel (py4, tTool, mNomSpeed1)
20  movel (py5, tTool, mNomSpeed2)
21  movel (py6, tTool, mNomSpeed3)
22  movel (py7, tTool, mNomSpeed3)
23  movel (py8, tTool, mNomSpeed3)
24  movel (py9, tTool, mNomSpeed3)
25  movel (py10, tTool, mNomSpeed3)
26  movel (py1, tTool, mNomSpeed3)
27  movej (jStart, tTool, mNomSpeed1)
28  waitEndMove ()
29  delay (0)
30 end
```

