

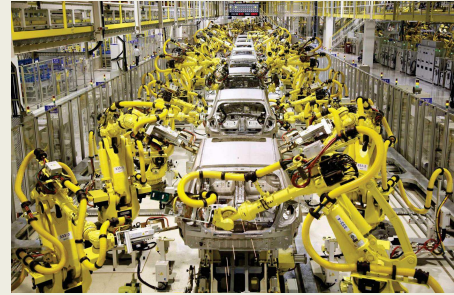
# PROGRAMOVANIE PRIEMYSELNÝCH ROBOTOV V PROSTREDÍ GRASSHOPPER

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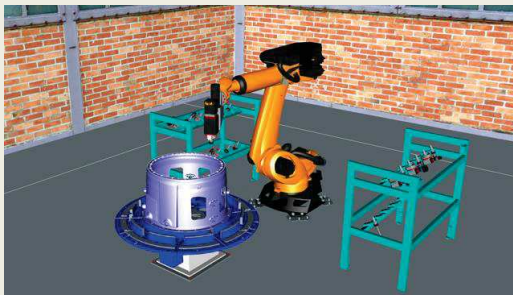


Unrestricted

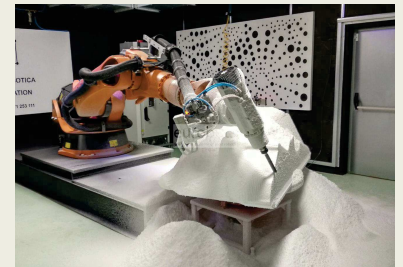
## Úvod programovania robotov



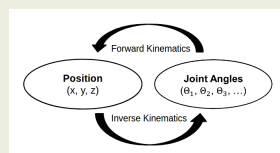
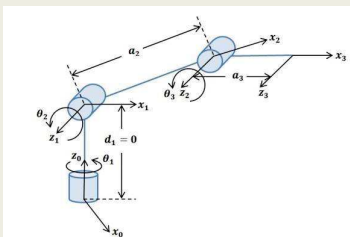
## Úvod programovania robotov



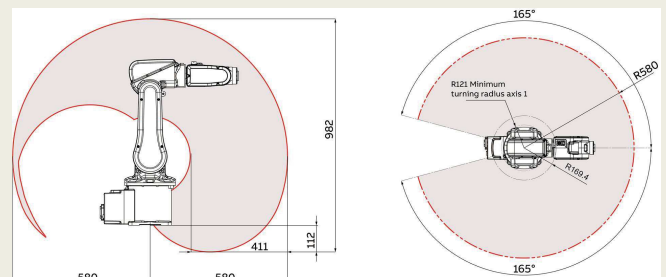
## Úvod programovania robotov



## Priama vs. Inverzná kinematika



## Náš robot ABB IRB 120



## Vlastnosti Grasshopperu + a -

- + rýchla tvorba kódu
- + kvalitne a kreatívne vývoje prostredie
- + možnosť vytvoriť si vlastné bloky (VB a C#)
- + dobrá krivka učenia
- + obrovské množstvo pluginov <https://www.food4rhino.com/>
- - nie je možnosť meniť naprogramové bloky
- - nízka efektívnosť kódu
- - väčšinou jednovláknové bloky – nemožnosť využitia viacerých jadier
- - otázná budúcnosť programovacieho prostredia (pre robotníkov)

## Co obsahujú robotické pluginy

- Generátor kódu pre špecifickú značku robotov.
- Nástroje na vytvorenie vlastnej kinematickej štruktúry robota
- Nástroje na vytváranie vlastných nástrojov
- Nástroje na setovanie bitov na IO kartách
- Simulátor kinematiky (rieši aj kolízie a singularitu nie vždy sedí s realitou)
- TCP-ip spojenie s robotom cez API robotického kontroléra
- Iné nástroje

## Robotické pluginy do grasshopperu

- Taco ABB – používam ho
- Hal Robotics (ABB, KUKA, UR)
- Kuka PRC
- RoboDK (ABB, Denso, KUKA, Fanuc, UR, Yaskawa)
- RobotsIO – vývoj je ukončený

## Ukážka generovaného kódu grasshopperom

```

1 MODULE MainModule
2 VAR speedData Work1:= [100,20,5000,1000];
3 PEEK toolData pencil1 := [ITEM, [(0,32,-27,33,205,21)], [(1,0,0,0)], [(0,3,[0,10,0,00,0,00]),[(1,0,0,0),0,0,0]);
4 PROC Main()
5   | grasshopper_final_automation.gh [P_BOB1]
6   | 21/04/2020 15:37:32
7   | Generated with TRIO for ABB
8   | https://taco.blokkfeld.com
9   |
10
11 MoveL [[382.3,0,291.281],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
12 MoveL [[470.98,138.55,121],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
13 MoveL [[470.98,137.55,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
14 MoveL [[471.08,137.61,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
15 MoveL [[470.98,137.55,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
16 MoveL [[471.08,137.55,121],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
17 MoveL [[470.98,137.55,121],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
18 MoveL [[430.03,127.57,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
19 MoveL [[432.7,128.74,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
20 MoveL [[434.04,109.72,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
21 MoveL [[434.27,89.75,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
22 MoveL [[437.61,55.03,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
23 MoveL [[437.37,37.49,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
24 MoveL [[435.85,20.43,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
25 MoveL [[435.85,20.43,121],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
26 MoveL [[435.24,19.03,121],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
27 MoveL [[435.24,18.03,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
28 MoveL [[434.44,8.29,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
29 MoveL [[434.01,-1.35,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj
30 MoveL [[435.25,-0.52,0],[0,0,707107,0,707107,0],[0,-1,-1,0],[0,989,989,989,989]],Work,el.pencil1|WObj:=WObj

```

## Ukážka prac 1/2



## Ukážka prac 2/2

**Bricklaying Robot**  
Parametric toolpath generation for industry robot.





Debugovanie (ukazať)

Video vytvoreného programu(ručne)

Koniec

Ďakujem za pozornosť

Otázky?