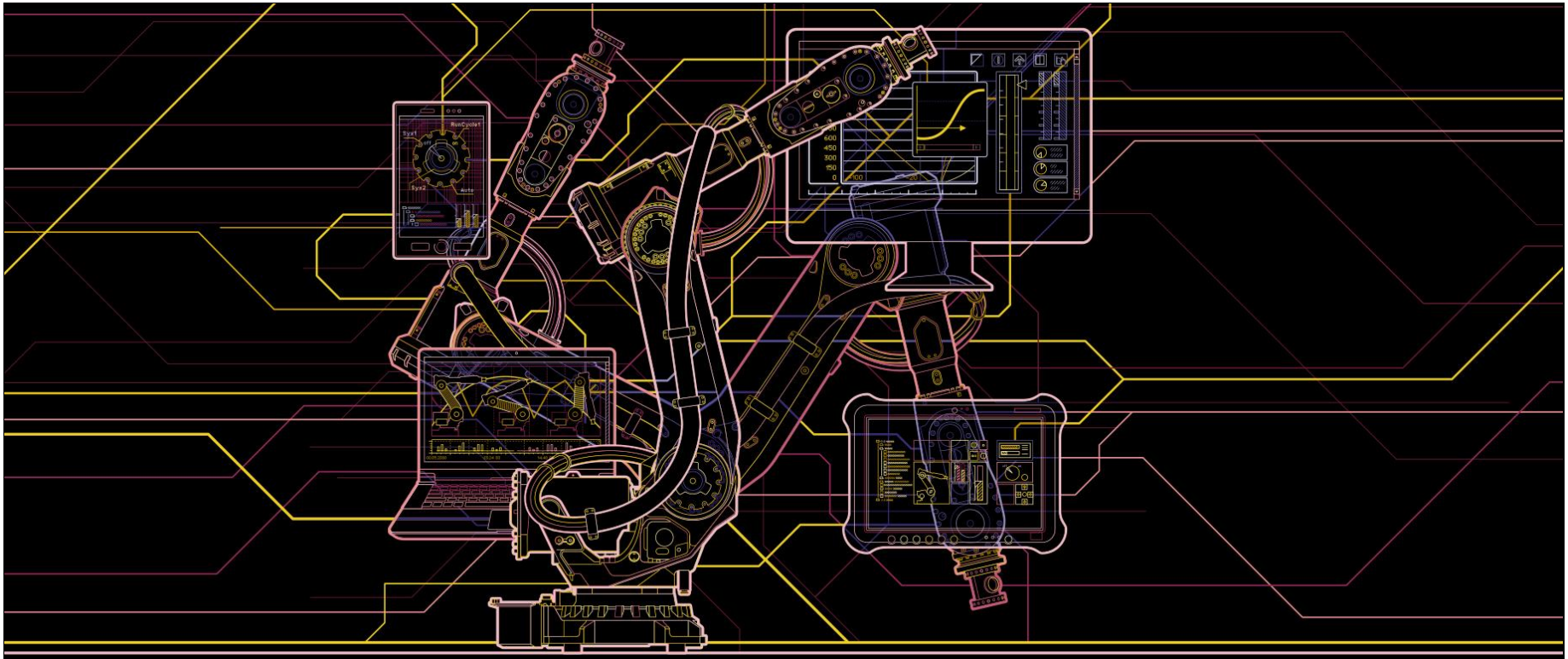


Keijo Hannula, ABB Robotics

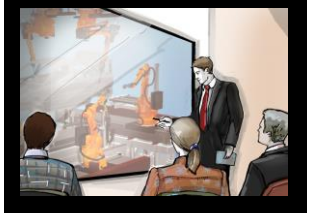
RobotStudio
Simulointityökaluna

RobotStudio
Mukana robottien elinkaaren kaikissa vaiheissa

Myynti

Myyntiehdotukset

Visualisointi

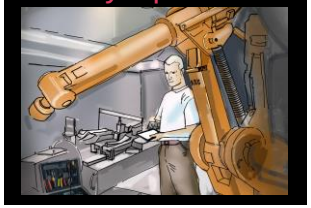


Projektit

Etävalvonta

Engineering

Robottikannan ylläpito



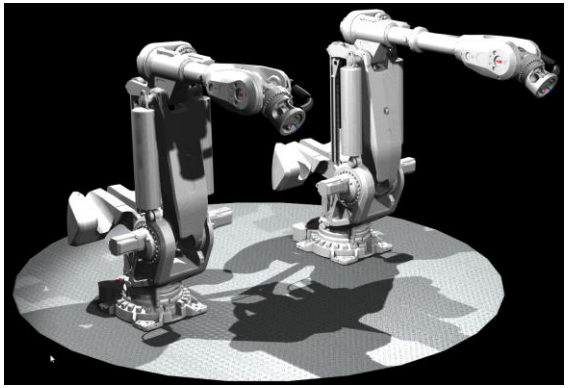
Operointi

Ylösajo

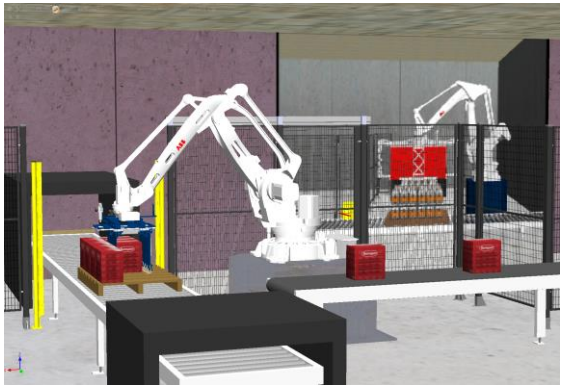
Virtuaalinen käyttöönotto

Simulointi

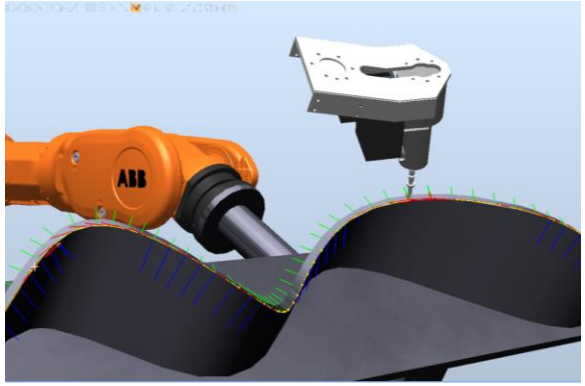
- Robottiaseman tarkkaan, kattavaan ja nopeaan simulointiin vaaditaan:



Robotti



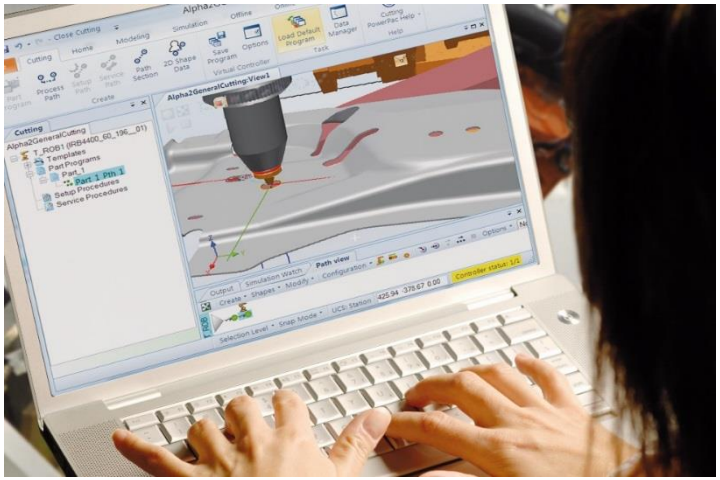
Ympäristö



Simulointityökalut

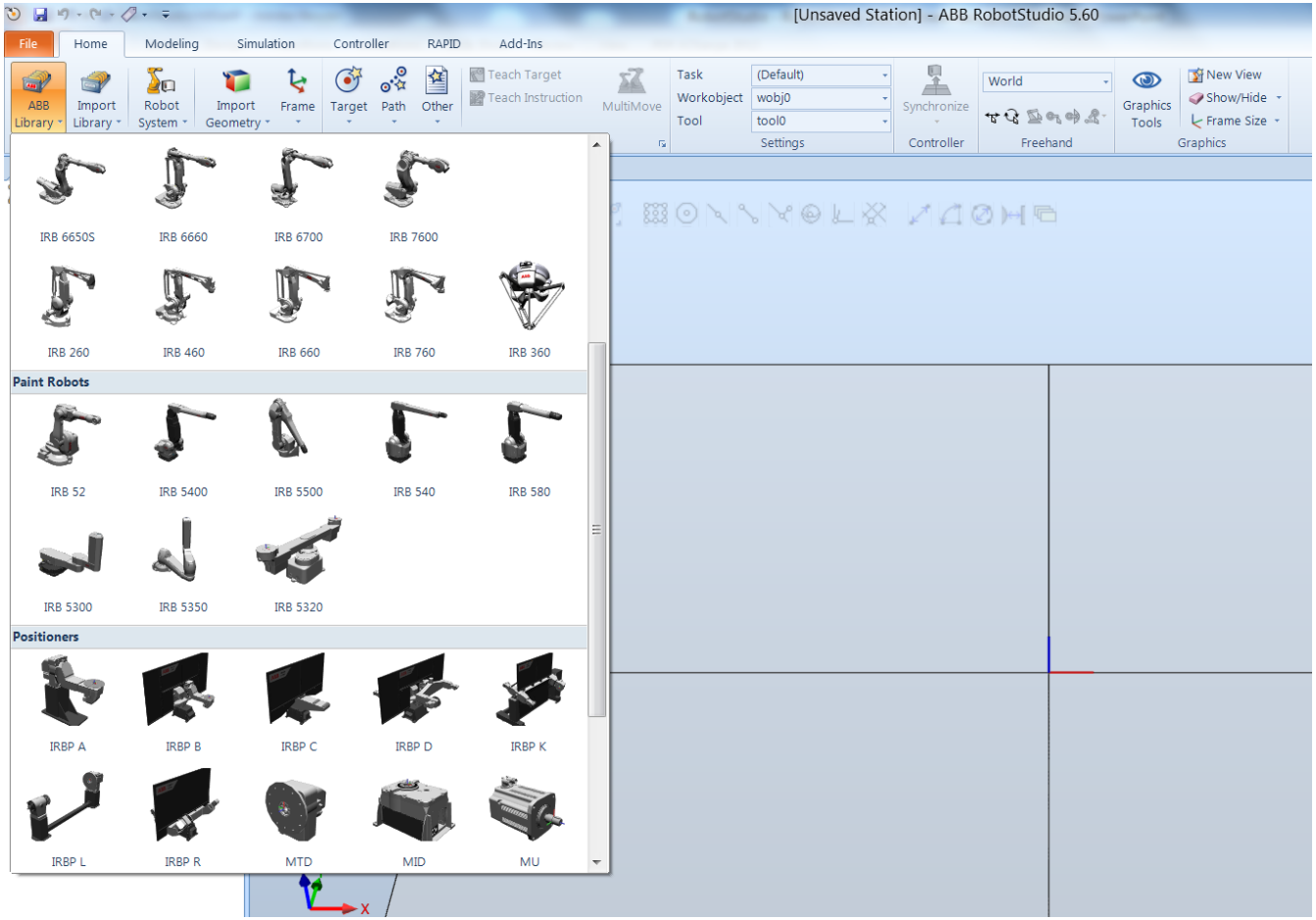
Robotti

- Perustuu Virtual Controller –teknologiaan
  - Sama RobotWare kuin oikealla robottiohjauksella
    - Järjestelmäoptiot
    - Parametrit
    - Ohjelmointikieli (RAPID)
  - Ohjelmien ja parametrien täydellinen yhteensopivuus virtuaalimaailman ja todellisuuden välillä



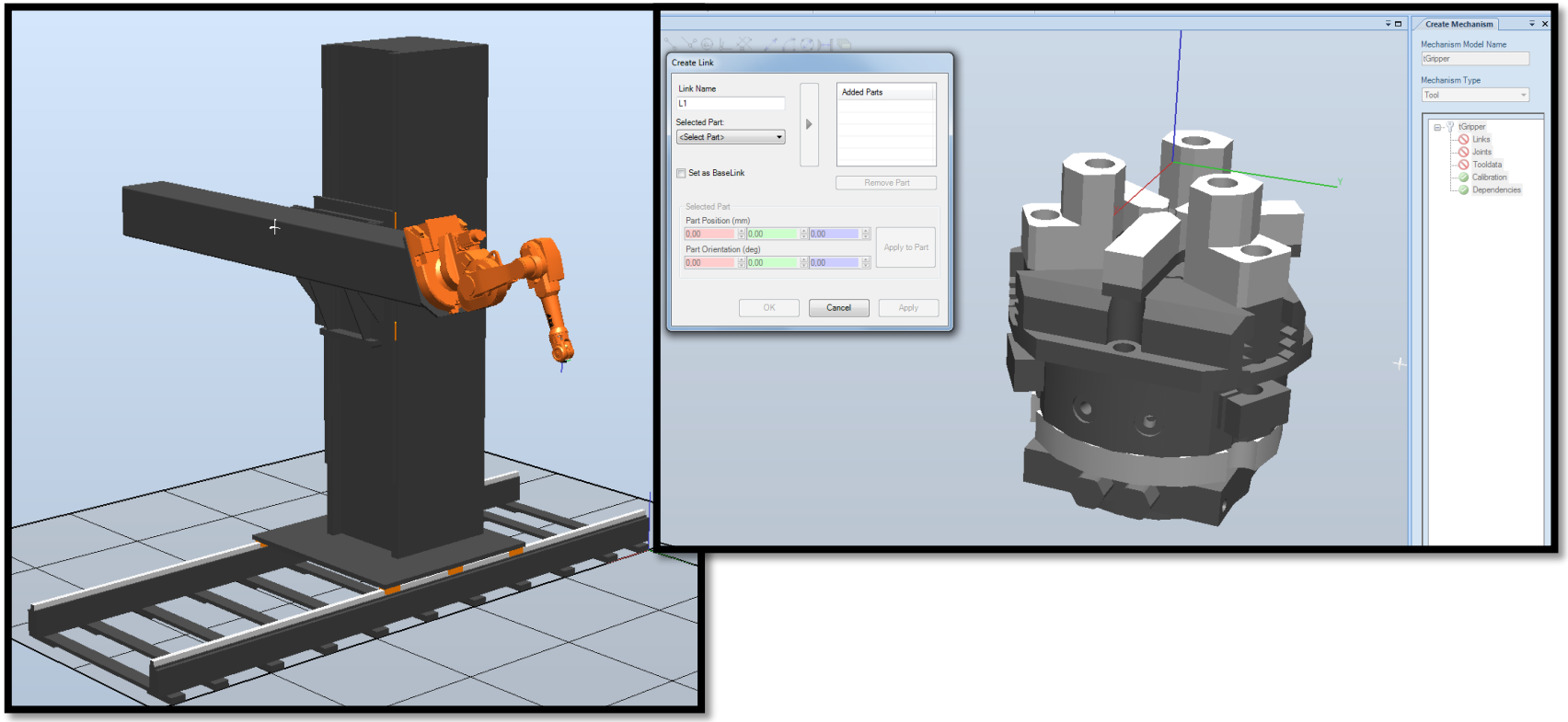
Robotti

- Kaikki ABB:n robotit, radat ja käsittelylaitteet valittavissa



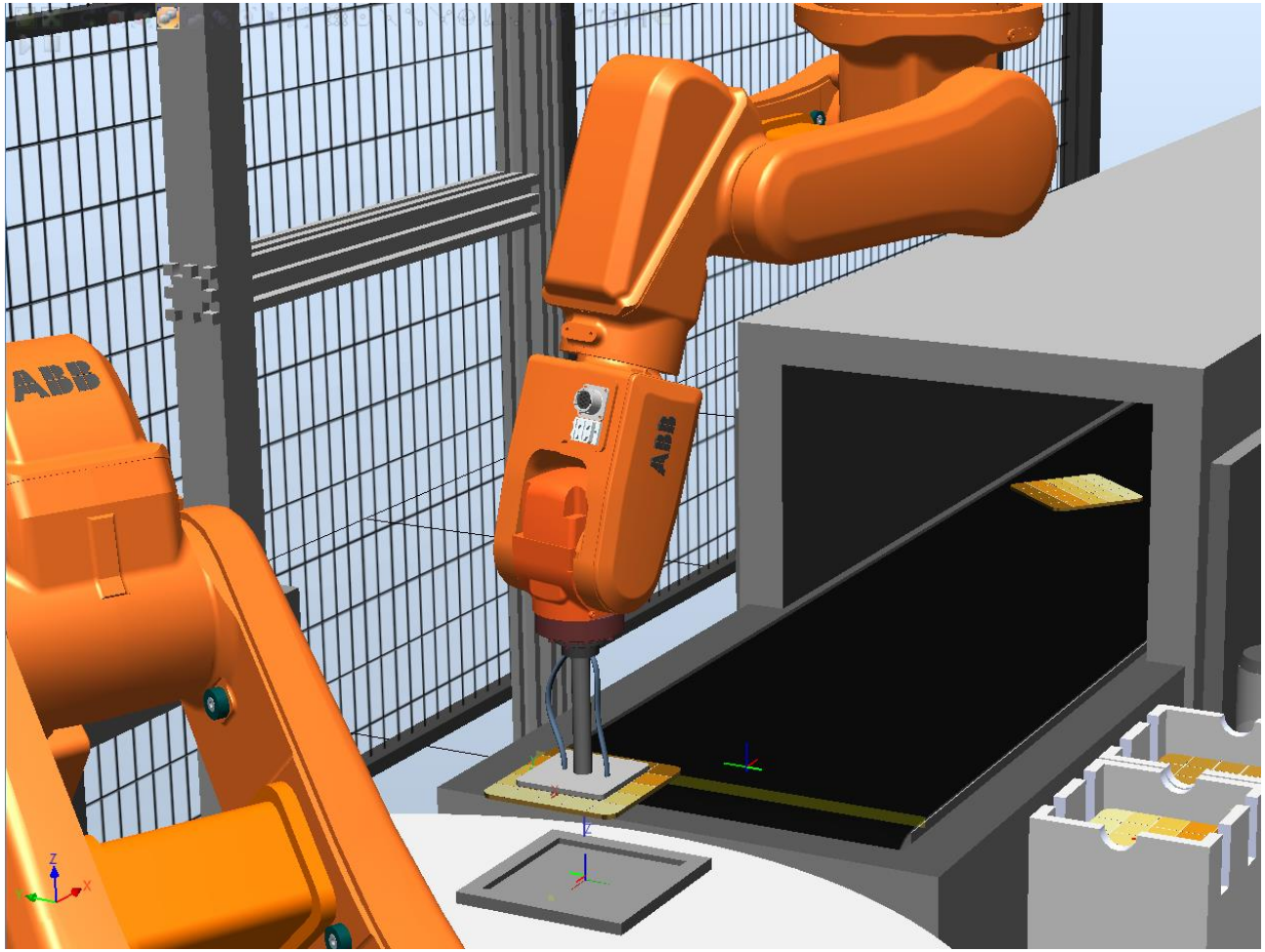
Robotti

- Työkalut sekä muiden valmistajien radat ja käsittelylaitteet voidaan mallintaa RobotStudiossa
  - Create Mechanism – rakenna oma mekanismi
  - External Axis Wizard -> Ohjausparametrit kinematiikalle



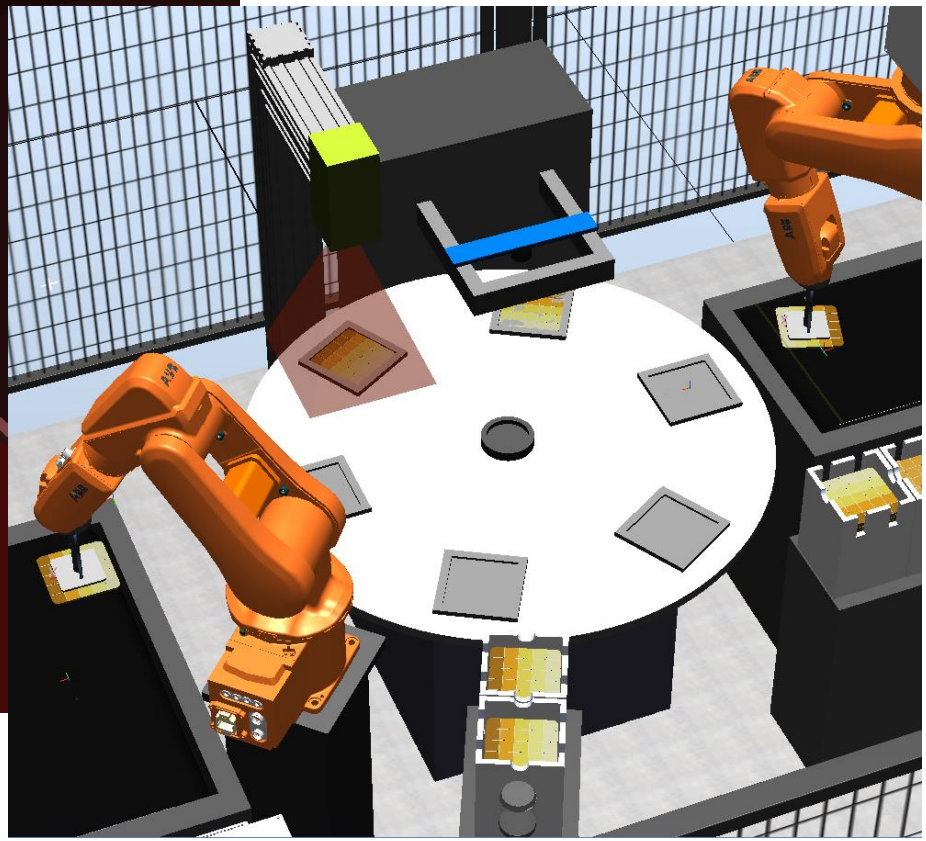
Ympäristö

- Smart Components – simuloi työkalun toiminta



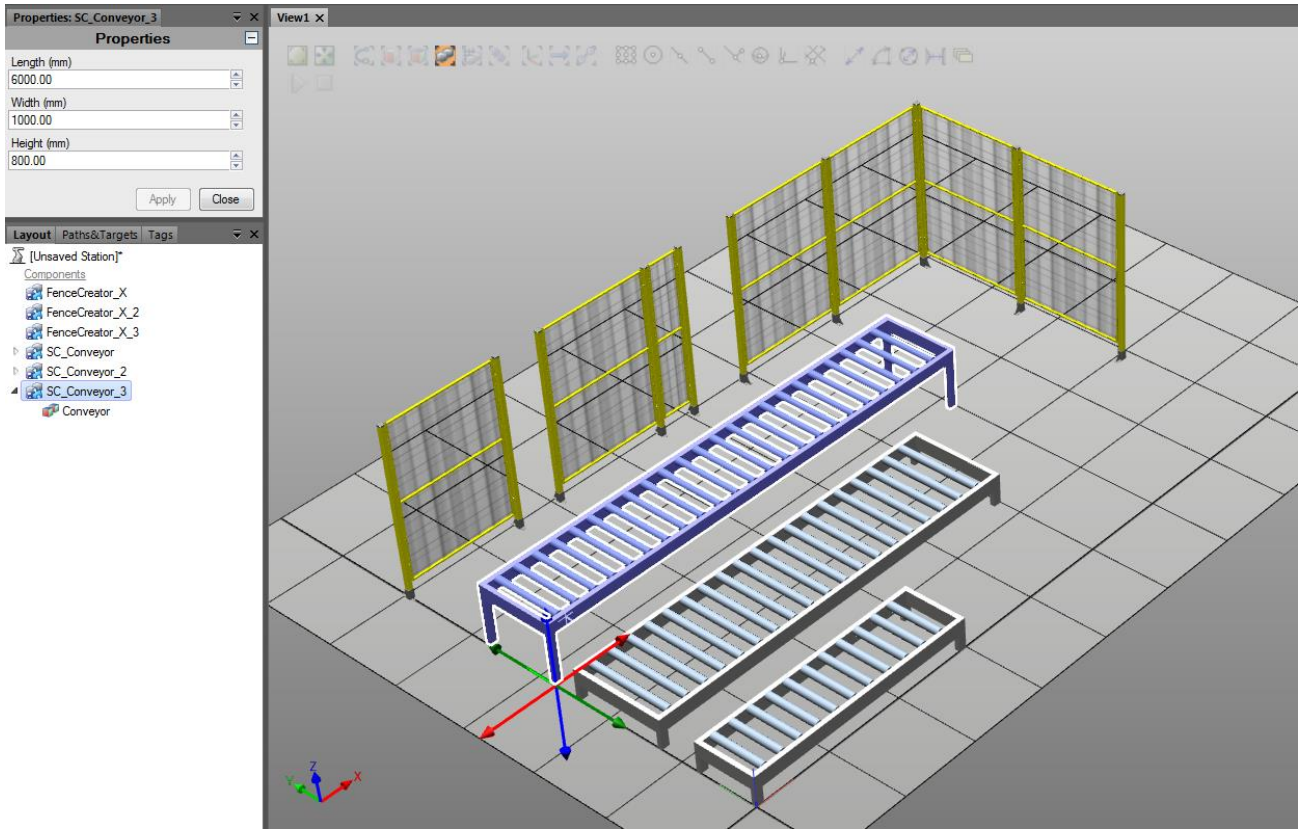
Ympäristö

- Smart Components – Simuloi koneen toiminta



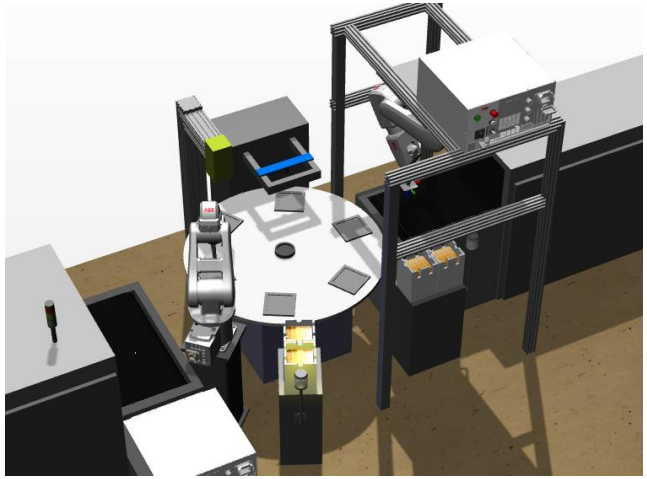
Ympäristö

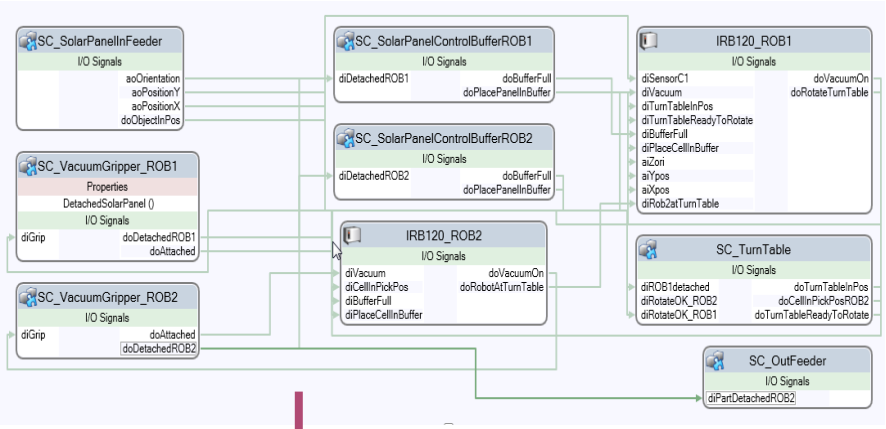
- Smart Components – Parametriset mallit



Ympäristö

- Station logic





- Export to XML

- Exportatut Station Logic –kytkennät voi helposti uudelleen käyttää uusissa asemissa

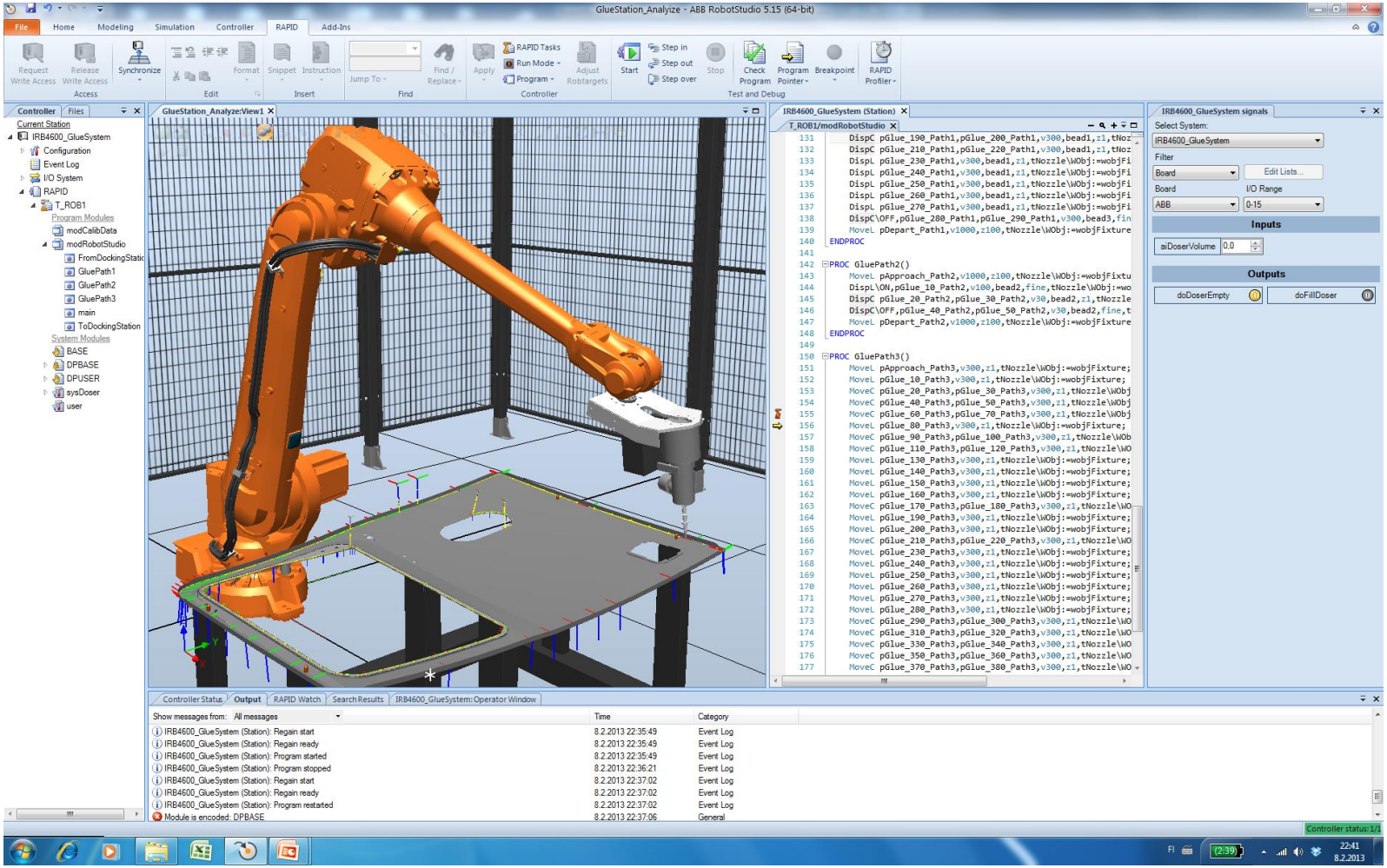
```
<Station name="Demo Solar Simulation" xmlns="urn:abb-robotics-robotstudio-graphiccomponent">
  <Connections>
    <IOConnection source="SC_SolarPanelInFeeder.doObjectInPos" target="IRB120_ROB1.diSensorC1" />
    <IOConnection source="IRB120_ROB1.doVacuumOn" target="SC_VacuumGripper_ROB1.diGrip" />
    <IOConnection source="SC_VacuumGripper_ROB1.doAttached" target="IRB120_ROB1.diVacuum" />
    <IOConnection source="SC_VacuumGripper_ROB1.doDetachedROB1" target="SC_TurnTable.diROB1detached" />
    <IOConnection source="IRB120_ROB1.doRotateTurnTable" target="SC_TurnTable.diRotateOK_ROB1" />
    <IOConnection source="SC_TurnTable.doTurnTableInPos" target="IRB120_ROB1.diTurnTableInPos" />
    <IOConnection source="SC_VacuumGripper_ROB2.doAttached" target="IRB120_ROB2.diVacuum" />
    <IOConnection source="IRB120_ROB2.doVacuumOn" target="SC_VacuumGripper_ROB2.diGrip" />
    <IOConnection source="SC_TurnTable.doCellInPickPosROB2" target="IRB120_ROB2.diCellInPickPos" />
    <IOConnection source="SC_VacuumGripper_ROB2.doDetachedROB2" target="SC_OutFeeder.diPartDetachedROB2" />
    <IOConnection source="SC_TurnTable.doTurnTableReadyToRotate" target="IRB120_ROB1.diTurnTableReadyToRotate" />
    <IOConnection source="SC_SolarPanelControlBufferROB1.doBufferFull" target="IRB120_ROB1.diBufferFull" />
    <IOConnection source="SC_SolarPanelControlBufferROB1.doPlacePanelInBuffer" target="IRB120_ROB1.diPlaceCellInBuffer" />
    <IOConnection source="SC_VacuumGripper_ROB1.doDetachedROB1" target="SC_SolarPanelControlBufferROB1.diDetachedROB1" />
    <IOConnection source="SC_SolarPanelControlBufferROB2.doBufferFull" target="IRB120_ROB2.diBufferFull" />
    <IOConnection source="SC_SolarPanelControlBufferROB2.doPlacePanelInBuffer" target="IRB120_ROB2.diPlaceCellInBuffer" />
    <IOConnection source="SC_VacuumGripper_ROB2.doDetachedROB2" target="SC_SolarPanelControlBufferROB2.diDetachedROB2" />
    <IOConnection source="SC_SolarPanelInFeeder.aoOrientation" target="IRB120_ROB1.aiZori" />
    <IOConnection source="SC_SolarPanelInFeeder.aoPositionY" target="IRB120_ROB1.aiYpos" />
    <IOConnection source="SC_SolarPanelInFeeder.aoPositionX" target="IRB120_ROB1.aiXpos" />
    <IOConnection source="IRB120_ROB2.doRobotAtTurnTable" target="IRB120_ROB1.diRob2atTurnTable" />
  </Connections>
  <GraphicComponents>
    <SmartComponent name="SC_TurnTable" t="-5.6183, -2.2199, 0" quat="1, 0, 0, 0">
      <Bindings>
        <PropertyBinding source="StopWatchVisionLight.TotalTime" target="ComparerVisionLight.ValueA" />
        <PropertyBinding source="StopWatchScreenPrinter.TotalTime" target="ComparerScreenPrinter.ValueA" />
        <PropertyBinding source="PlaneSensorAttachPoint.SensedPart" target="Attacher.Child" />
        <PropertyBinding source="PlaneSensorDetachPoint.SensedPart" target="Detacher.Child" />
      </Bindings>
      <Signals>
        <IOSignal name="diROB1detached" signalType="DigitalInput" value="0" />
        <IOSignal name="diRotateOK_ROB2" signalType="DigitalInput" value="0" />
        <IOSignal name="diRotateOK_ROB1" signalType="DigitalInput" value="0" />
```

Ympäristö

- IO Simulator – Suorita ohjelma IO-käskyjen kanssa

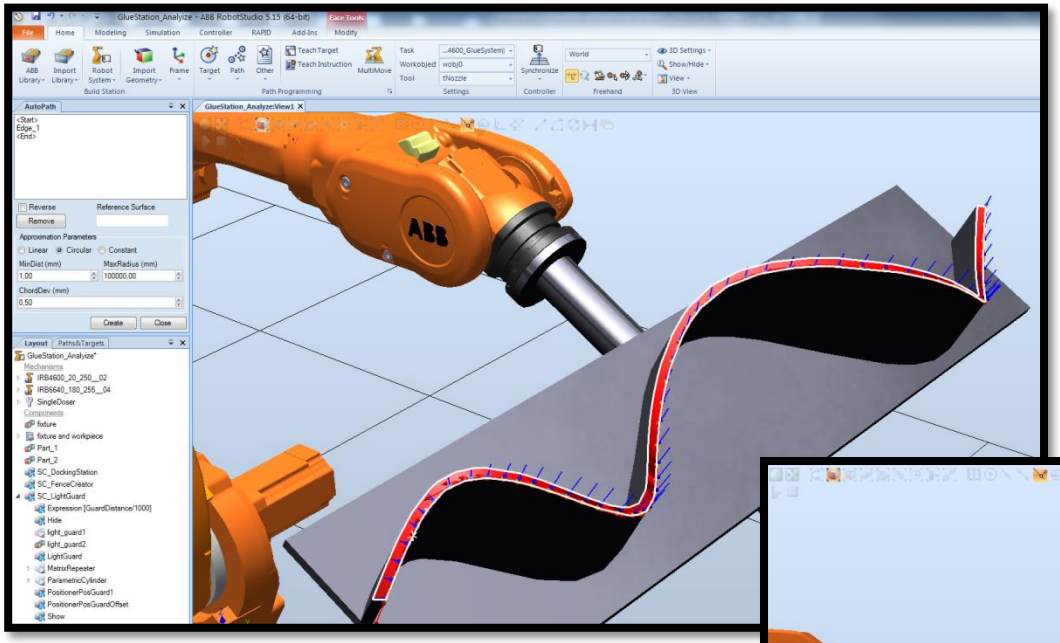
Simulointityökalut

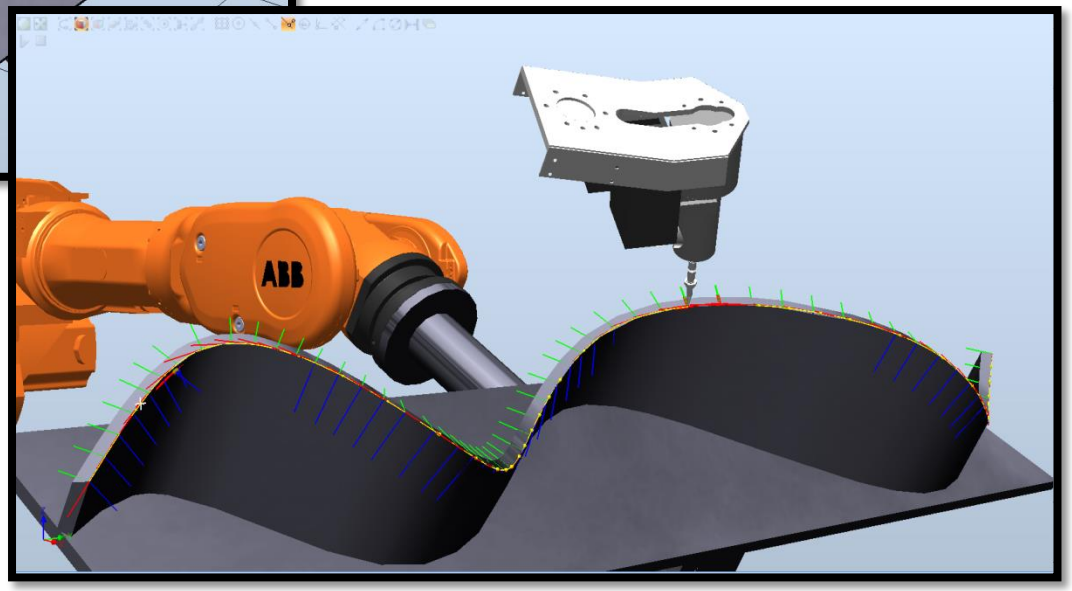
- Rapid editori



Simulointityökalut

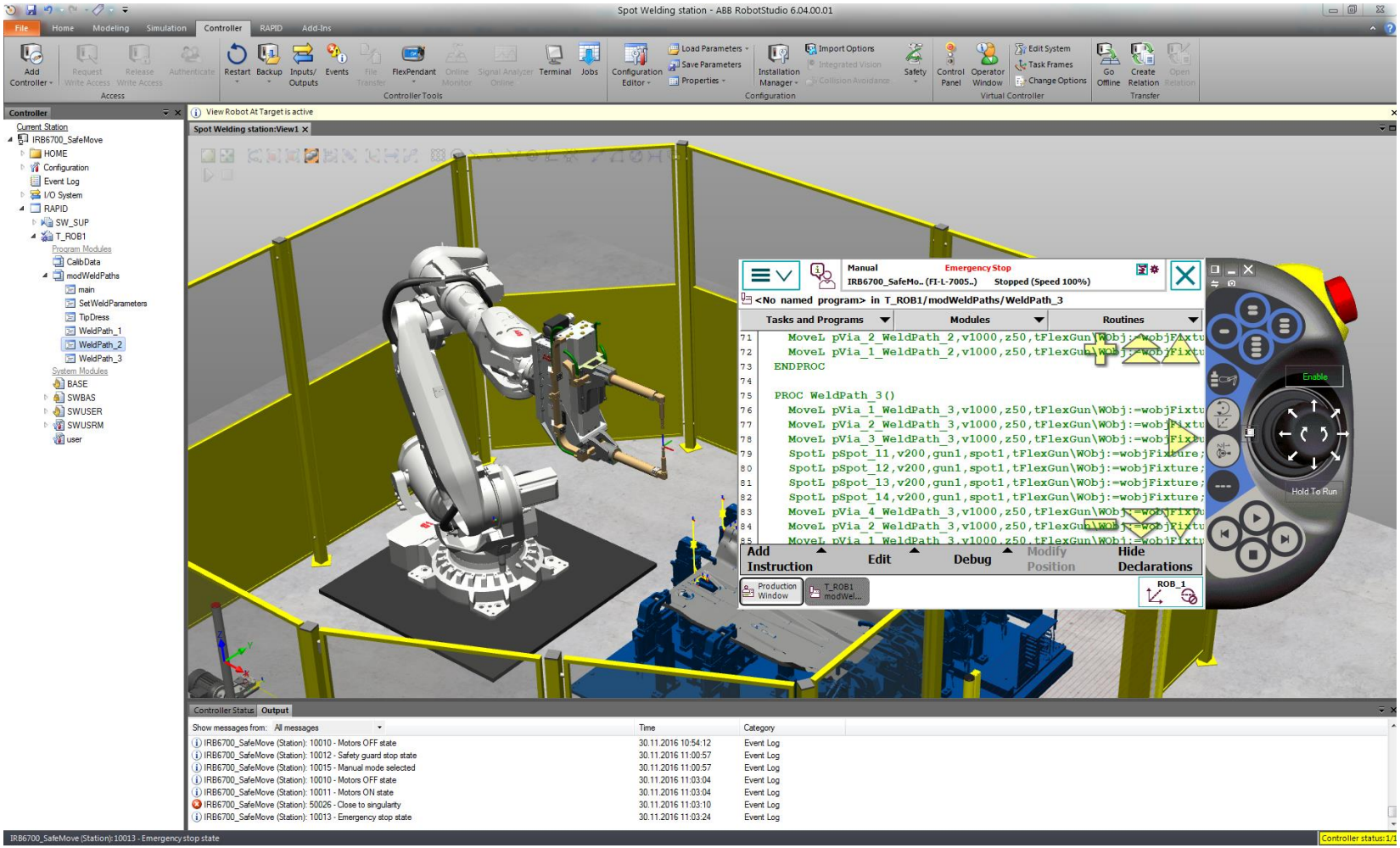
- Graafinen ohjelmointi





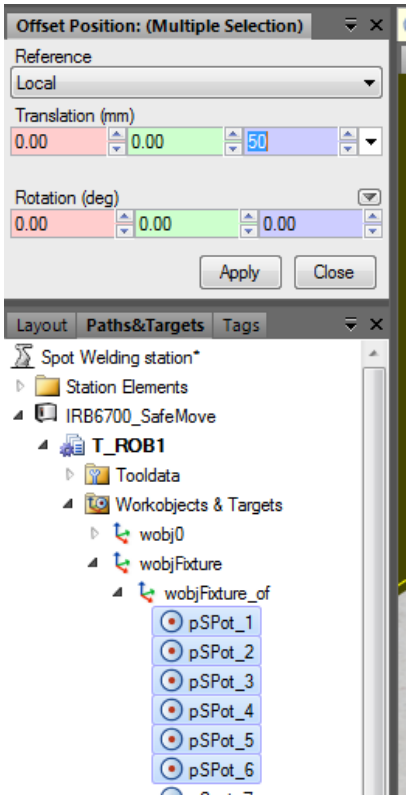
Simulointityökalut

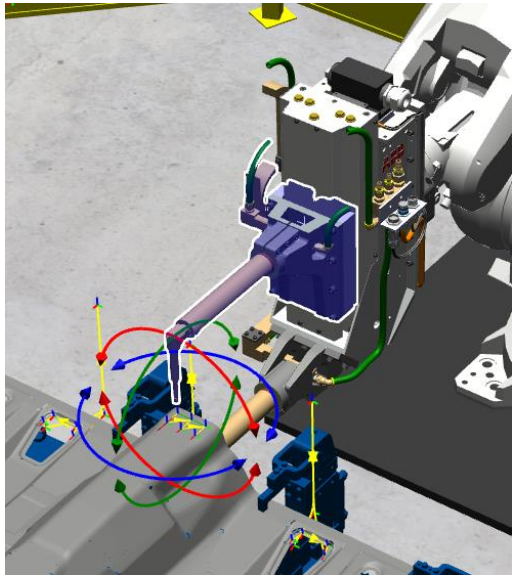
- Virtual pendant



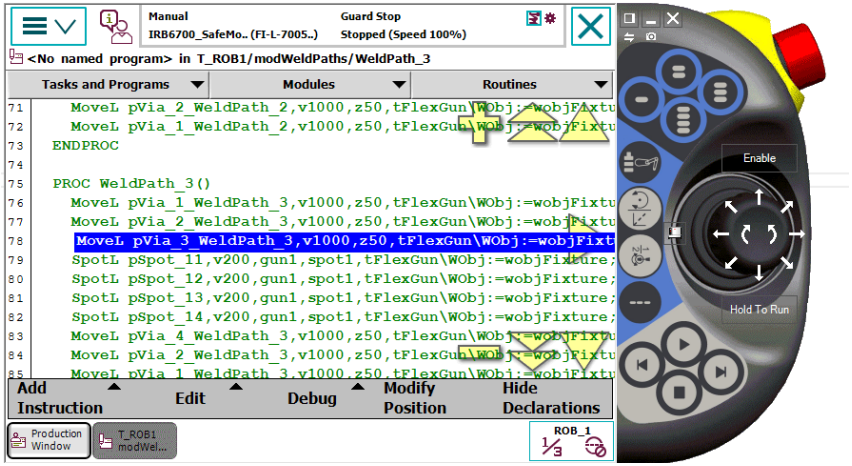
Simulointityökalut

- Paljon eri tapoja muokata pisteiden paikkaa, orientaatiota, konfiguraatiota, ulkoakseleiden arvoja ja muita muuttujia.



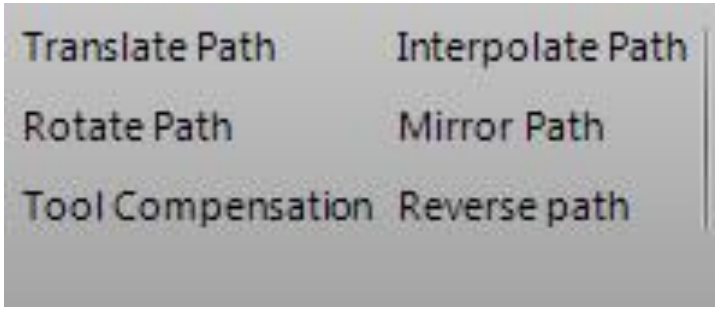


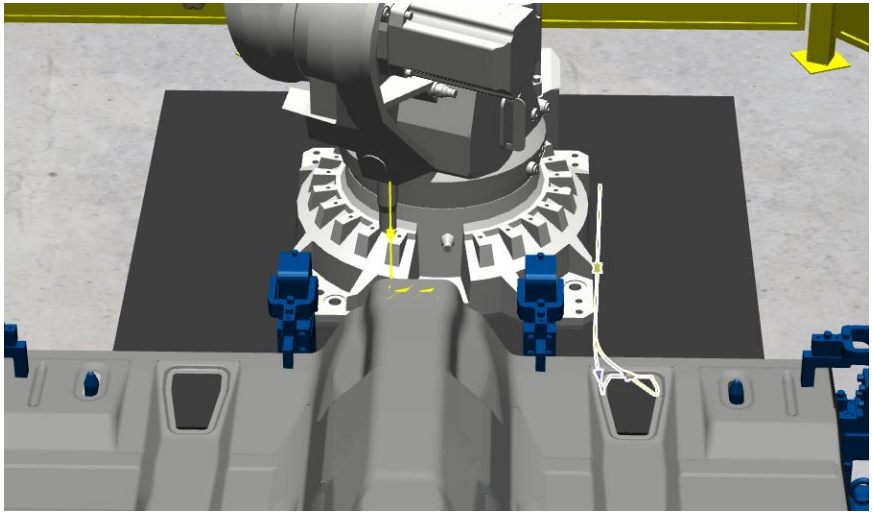
```
PROC WeldPath_2()
   MoveL pVia_1_WeldPath_2,v1000,z50,tFlexGun\WObj:=wobjFixture;
   MoveL pVia_2_WeldPath_2,v1000,z50,tFlexGun\WObj:=wobjFixture;
   MoveL pVia_3_WeldPath_2,v1000,z50,tFlexGun\WObj:=wobjFixture;
   SpotL pSPot_1,v200,gun1,spot1\OpenHLift,tFlexGun\WObj:=wobjFixture;
   SpotL pSPot_2,v200,gun1,spot1,tFlexGun\WObj:=wobjFixture;
   SpotL pSPot_3,v200,gun1,spot1,tFlexGun\WObj:=wobjFixture;
   SpotL pSPot_4,v200,gun1,spot1,tFlexGun\WObj:=wobjFixture;
   SpotL pSPot_5,v200,gun1,spot1,tFlexGun\WObj:=wobjFixture;
   SpotL pSPot_6,v200,gun1,spot1,tFlexGun\WObj:=wobjFixture;
   MoveL pVia_2_WeldPath_2,v1000,z50,tFlexGun\WObj:=wobjFixture;
   MoveL pVia_1_WeldPath_2,v1000,z50,tFlexGun\WObj:=wobjFixture;
ENDPROC
```

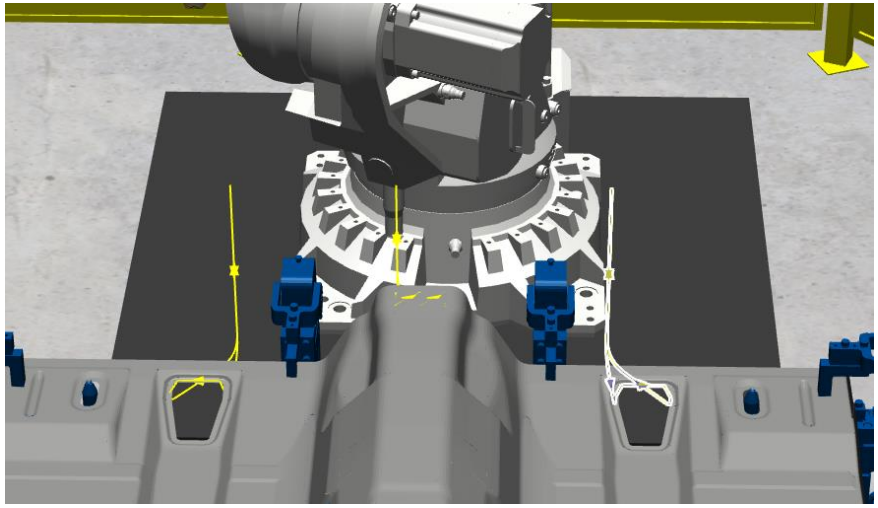


Simulointityökalut

- Polun kopiointi ja peilaus
- Siirto, kierto ja suunnan kääntö
- Työkalun kompensointi
- Interpolointi

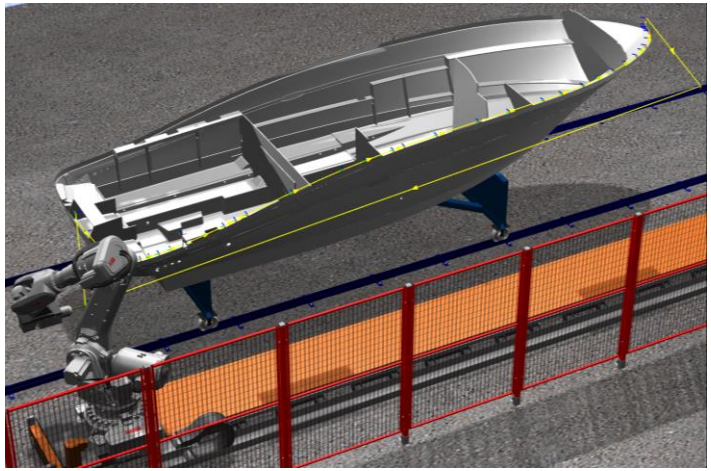


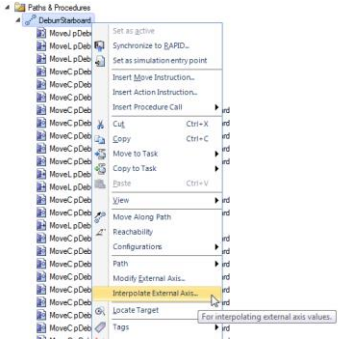


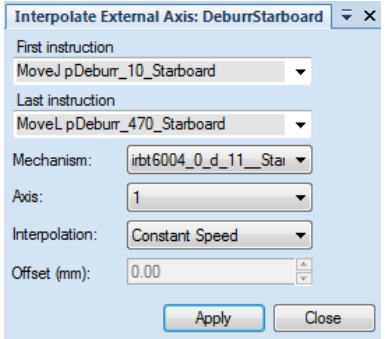


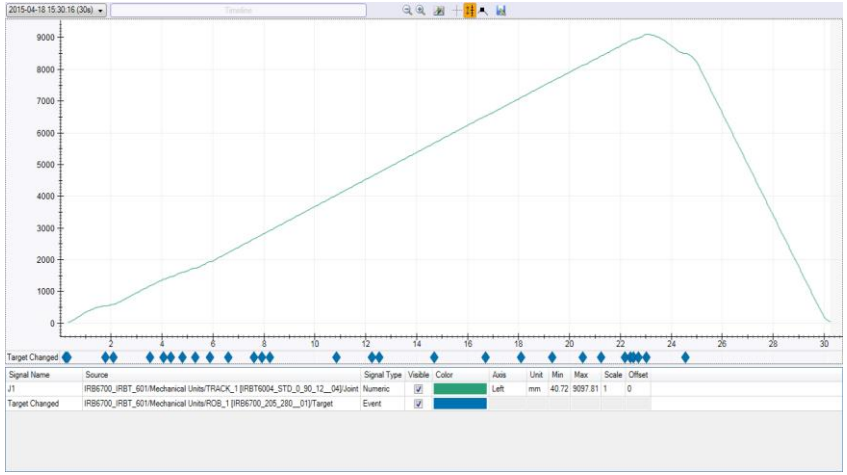
Simulointityökalut

- Ulkoakseleiden interpolointi



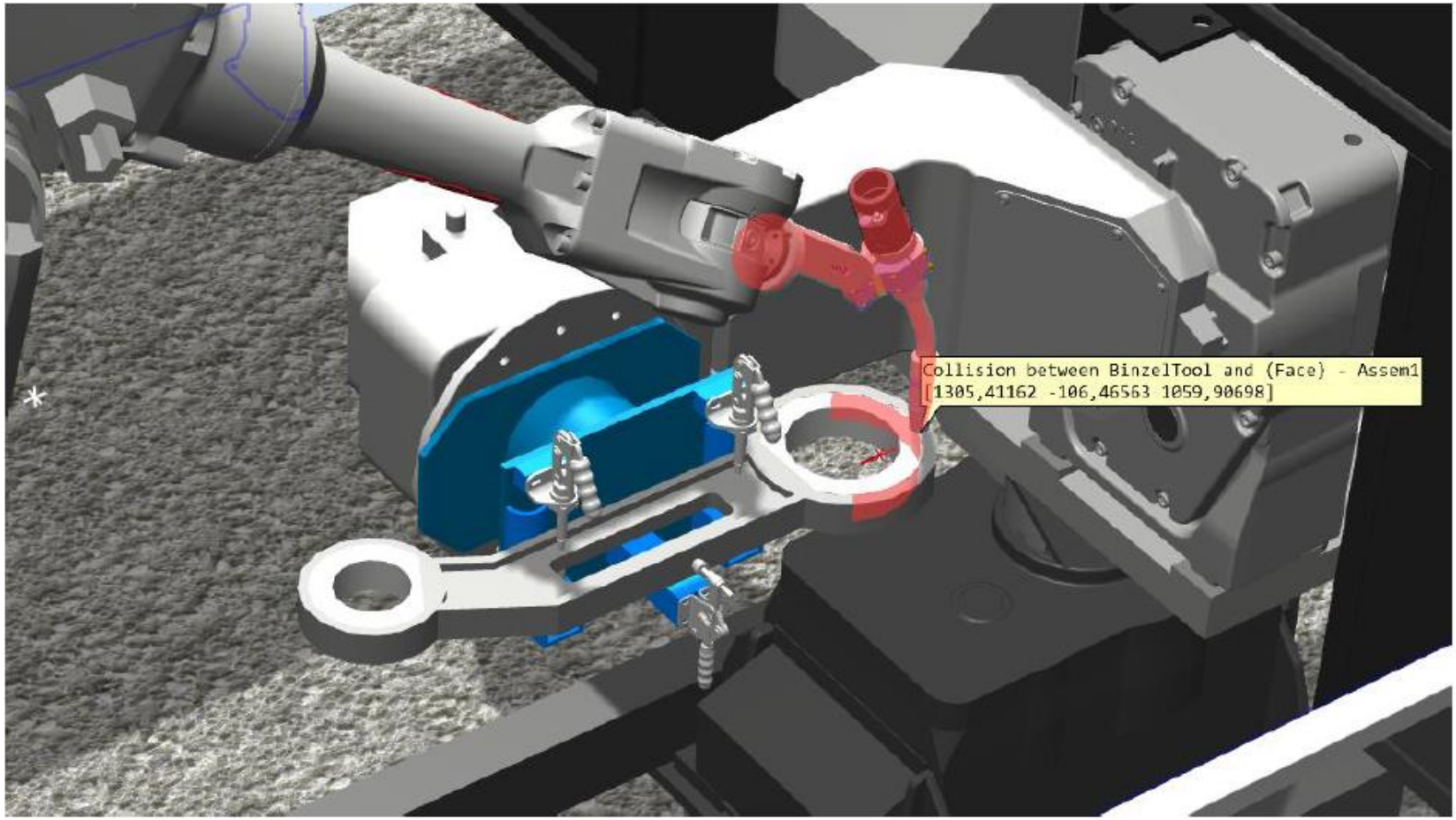






Simulointityökalut

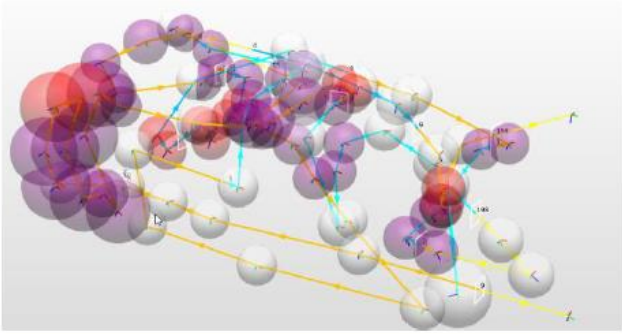
- Törmäystarkastelussa korostetaan törmäävät osat ja tekstikenttä kertoo tarkemmat tiedot törmäyksestä



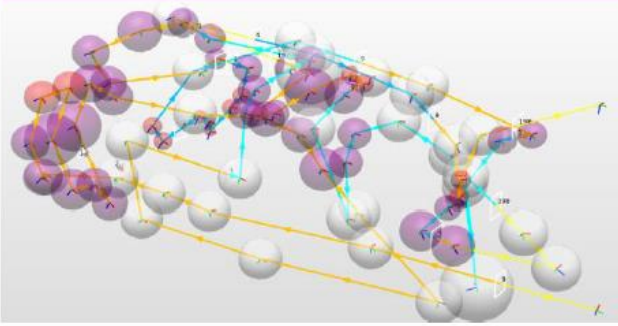
Simulointityökalut

- Visualisoi zone-arvot

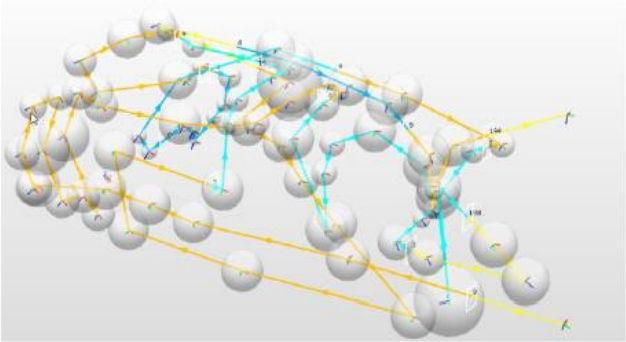
Programmed zones



Actual zones as executed by controller



Zones reduced by RobotStudio



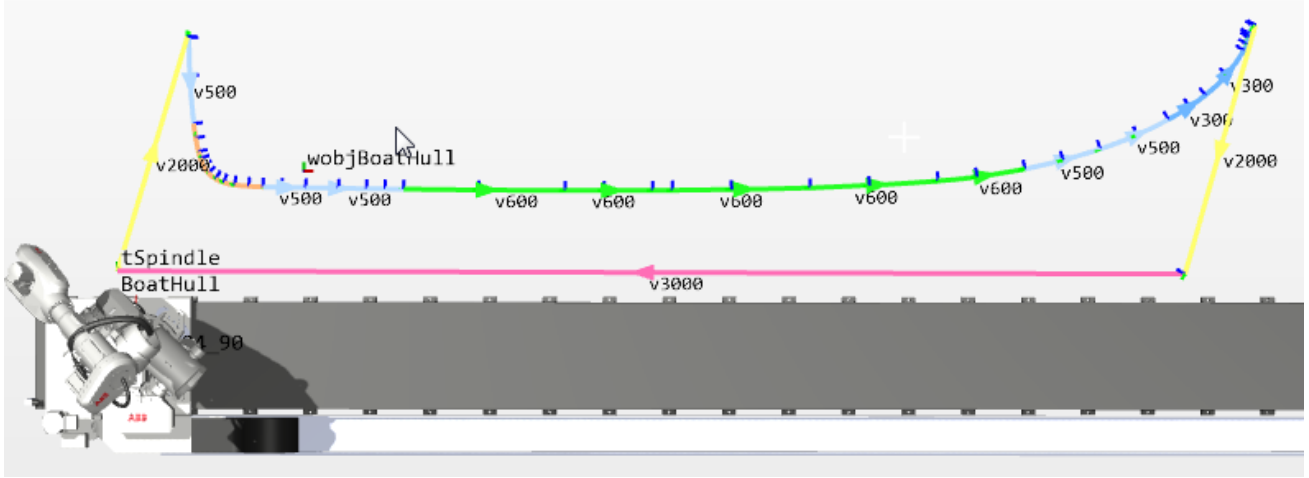
Punainen – Alue ylittää edeltävän tai seuraavan paikkapisteen sekä päällekkäisyyksiä alueissa

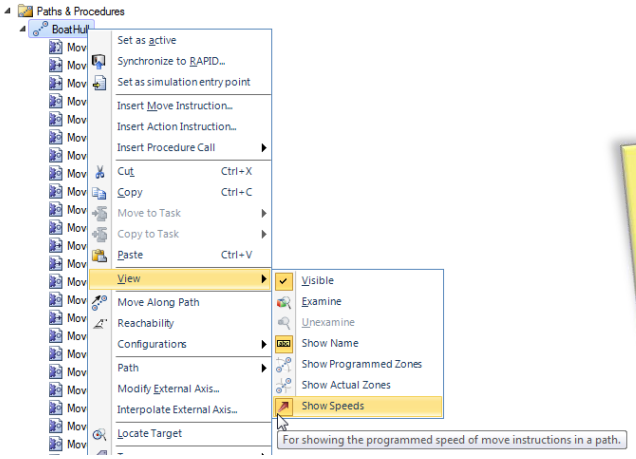
Violetti – Päällekkäisiä aluemäärityksiä

Valkoinen – Ei päällekkäisyyksiä

Simulointityökalut

- Visualisoi nopeus

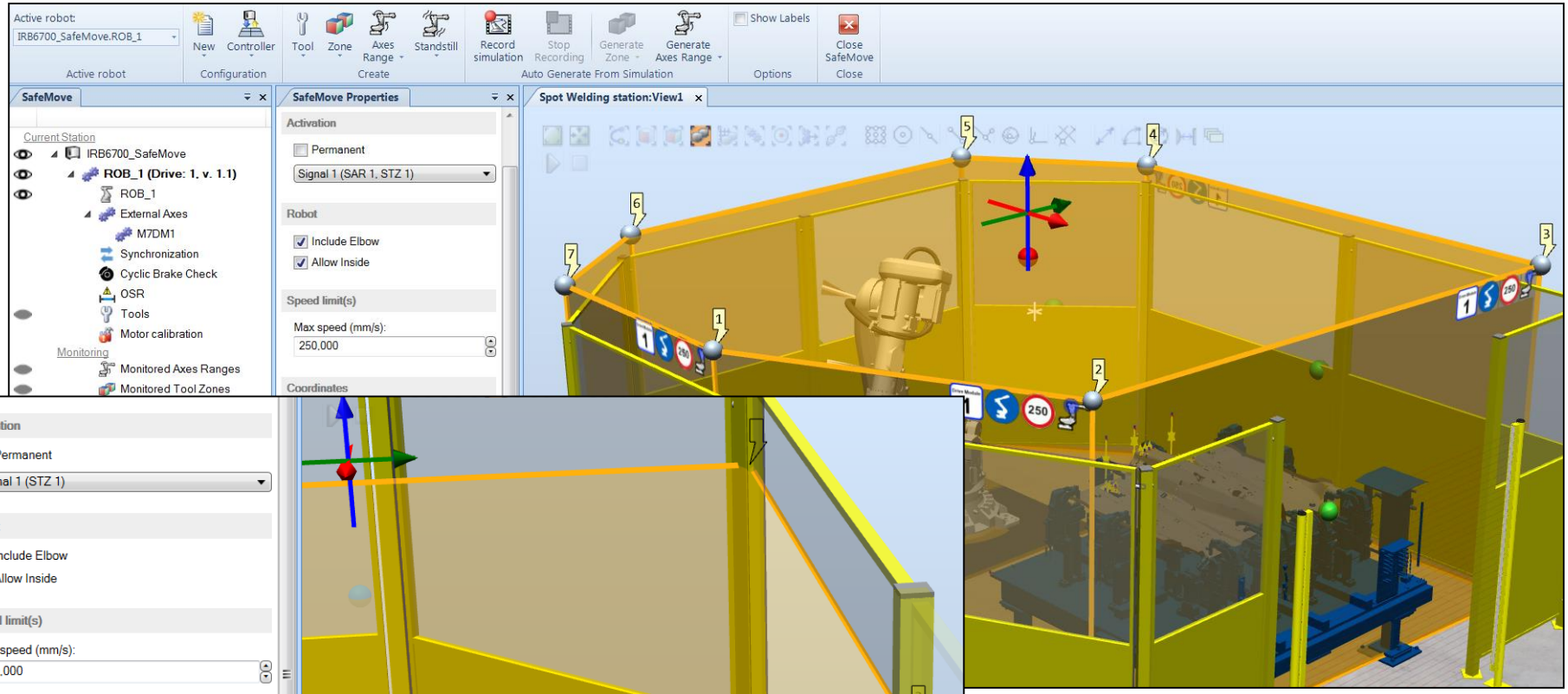


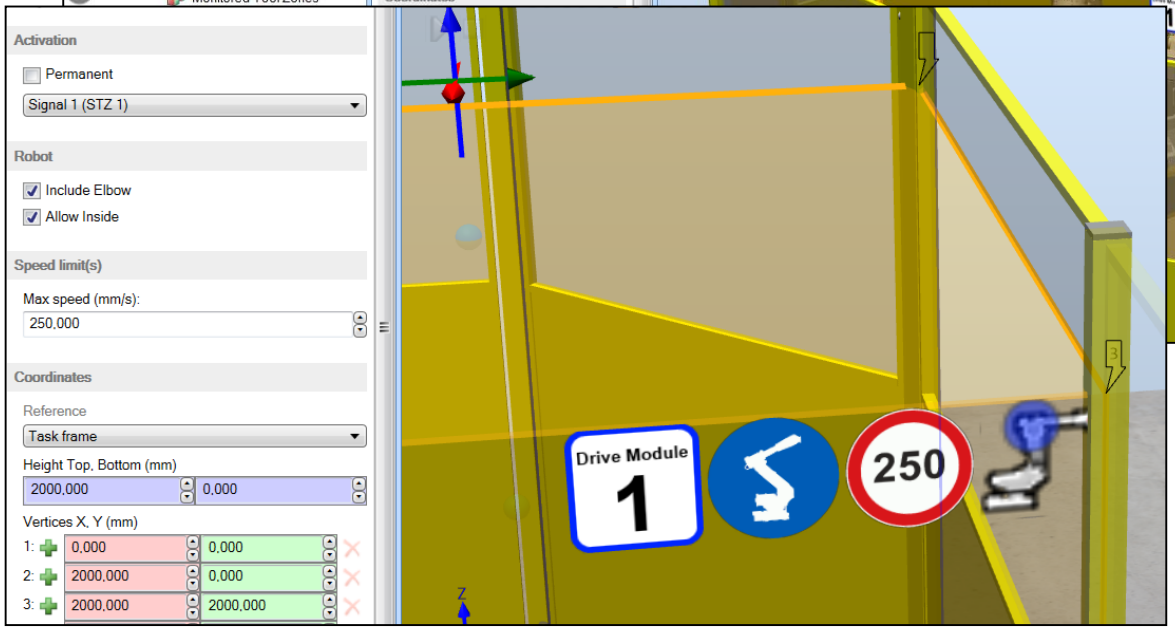


- *Ohjelmoidun vauhdin visualisointiin. Väliaikaisesti ylikirjoittaa Path:n värin*

Simulointityökalut

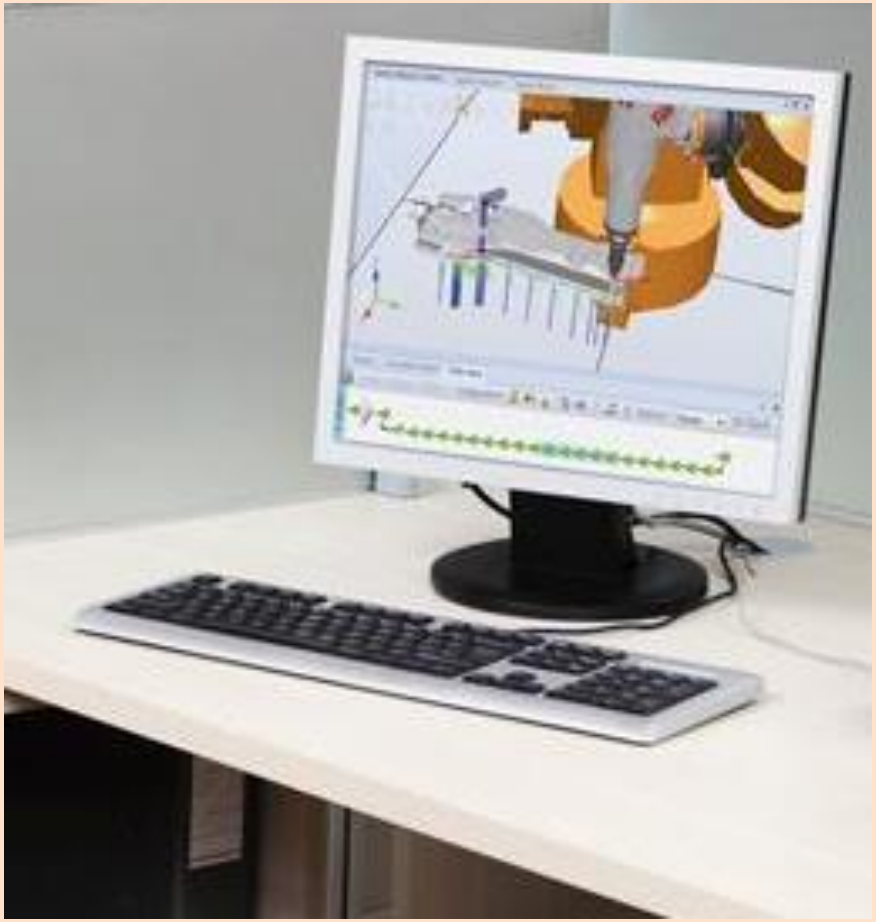
- Visualisoi turva-alueet





Simulointityökalut

- Sovelluskohtaiset PowerPac-lisäosat

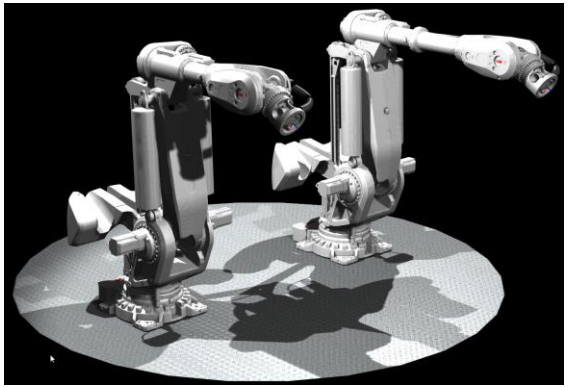


▪RobotStudio® PowerPacit

- Arc Welding
- Palletizing
- Painting
- Machining
- Cutting
- Picking & Packing
- Machine Tending

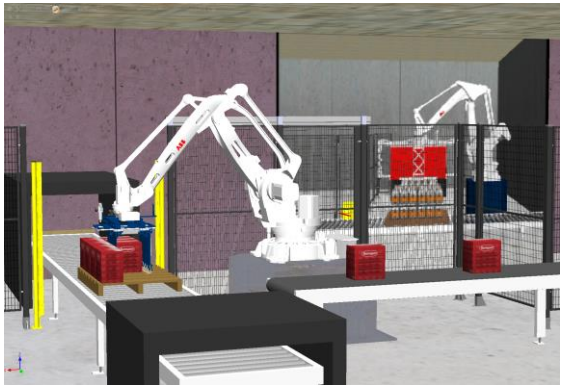
Kertaus

- Robottiaseman tarkkaan, kattavaan ja nopeaan simulointiin vaaditaan:



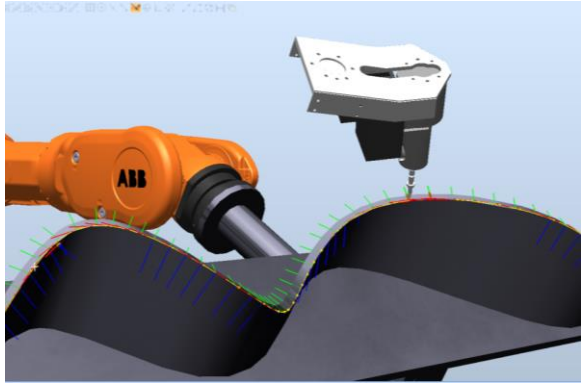
Robotti

- Virtual Controller



Ympäristö

- Smart Components



Simulointityökalut

- RAPID editori
- Graafinen ohjelmointi
- Power Pacit
- …

Kysy lisätietoja:

keijo.a.hannula@fi.abb.com