

CPolish

COBOTSYS SUPPORT

Do as you can, Follow your heart.

Rapid Design, Validation, and Execution of
Force-Controlled Grinding Process for Robots

► Product Description

Because of the advantages of industrial robots including accuracy, reliability, and flexibility, more and more manufacturing enterprises are trying to use industrial robots to grind, polish, and deburr workpieces. However, it takes long to program and it is difficult to debug an accurate and complex grinding trajectory for industrial robots. However, it is still a difficult task to specify the polishing trajectory in terms of path, speed and force profiles, etc, it requires high consistency of workpieces, and high accuracy of calibration of the workstation. Traditional off-line programming solutions can solve the complex problem of trajectory programming, but they require good workpiece consistency and accurate workstation calibration, which makes it still very difficult to install, debug and use industrial robots in the grinding process.

CPolish is a self-developed polishing system integrating machine vision and force control by COBOT. Based on the 3D camera, this system can quickly scan and model the polished workpiece and calculate the coordinates of the workpiece in the 3D space. Then, based on the model reconstructed by vision, the system can quickly generate the path and realize the rapid design of the grinding process path through various ways such as intelligent teaching drag trajectory design. The introduction of force control in the grinding process also greatly improves the quality of the workpiece grinding, machining efficiency and equipment safety.

CPolish can adjust the majority of robotic grinding process of complex workpieces in 4 hours, such as propellers, wind turbine blades, turbine blade and so on.

► Product Advantages



Intelligence and Perception

Intelligent robotic fusion of machine vision by 3D camera enables rapid modeling and spatial orientation of workpieces and environment, making industrial robots more intelligent, flexible and more adaptable to the environment.



Simple and Flexible

By applying fast trajectory generation and 3D simulation techniques, users are capable of programming for complex trajectories rapidly and verifying the validity of designed polishing process. The planned trajectory can be modified online by technology experts through user-friendly interface. Moreover, the object to be polished which can be readily applied to other robots with very different kinematics.



Efficient and Precise

With advanced algorithms of force control and trajectory optimization, CPolish can significantly increase the speed of polishing complex-shaped workpiece. It can also apply constant force control and real-time path correction during polishing process to improve polishing quality.



Modular Design

The design of software and hardware fully consider the concept of modular design, can ensure that the workstation in a variety of tasks, able to realize the application and functions rapidly.



Efficient and Precise

The force-protection technique of CPolish can guarantee the safety of devices under 7*24 hours of continuous running.

► Product Details



Fast Trajectory Generation

To simplify the design and debugging of grinding process, CPolish provides two fast trajectory generation functions: the model reconstruction based on 3D vision can realize the fast path design and the fast track generation technology of intelligent teaching. Data of posture and six - dimensional force sensor were collected synchronously during polishing. CPolish provides the simplest and friendliest programming method for complex motion trajectory.



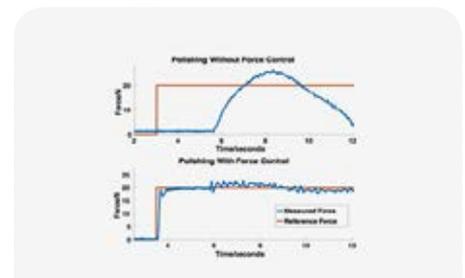
6-Dimension Force Sensor

CPolish can optimize the grinding path in real time, based on the force-level hybrid control algorithm.

The hardware part uses a six - dimensional force transducer which can measure three axial forces and torques.

Specifications

Fx, Fy	200N
Fz	200N
Tx, Ty	10Nm
Tz	6.5Nm



Intelligent Force-Control Software

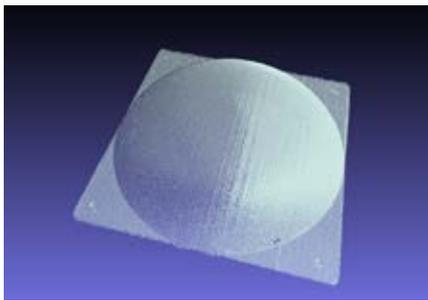
CPolish has the following characteristics of force control software:

- Automatic Calibration of Force Sensor
- Load Recognition and Gravity Compensation of Force Sensor
- Temperature Compensation of Force Sensor
- Bayesian Filtering
- Constant Force Control
- Variable Speed Control
- Force-based Protection and Recovery
- Force-based Monitoring

► Grinding Task Flow

1 Set the Scene

Set up the polishing scene, and locate the workpiece and clamp the tools.

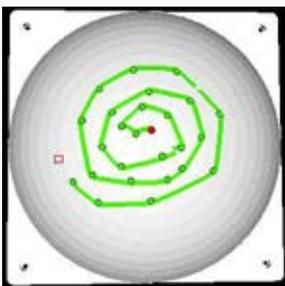
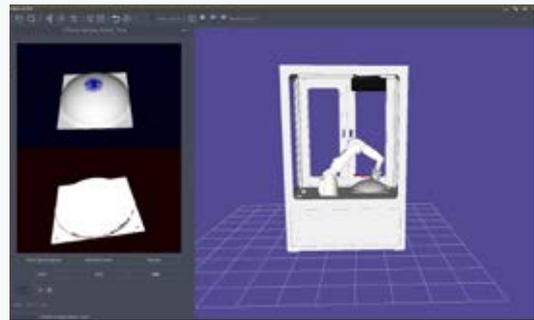


2 Scanning Modeling

Above the robot, it is equipped with a 3D structural light camera, which can collect the point cloud of the workpiece, reconstruct the modeling and get the location of the workpiece.

3 Process Design

CPolish provides two grinding process design methods: intelligent teaching and 3D interface interaction. It can refine, emulate, and optimize grinding trajectory and force field automatically.



4 Automatic Track Generation

The trajectory is generated quickly according to the designed path, and the designed trajectory is verified by simulation to prevent collision and singular posture.

5 Grinding Execution

According to the grinding process set by the user, CPolish performs hybrid force-position control, flexibly adjusts the grinding trajectory of the robot, and monitoring the grinding process in real time.



► Applications



Grinding blade:

To deal with complex surfaces, CPolish discards the traditional teaching mode, imports the model of the blade into the CPolish system and selects a specific path point. The system can automatically generate the grinding track, which greatly saves programming work.



Polishing the furniture:

A lot of furniture paint surface requires frosting process, constant force control of CPolish system to ensure that the grinding head smoothly glides across the paint surface, leaving a beautiful frosted surface.



Sanding notebook panel:

Every time before baking, it is necessary to polish the primer (putty). The key to polishing the primer is to control the amount. CPolish system can not only facilitate the optimization of polishing track and speed, but also adjust the intensity of polishing to achieve the optimal effect.

► Parameter Configuration

Performance Standards	
Force Control Model	Constant Force/Variable Speed Control
Force Control Accuracy	1N
Force Range	0~200N
Temperature Range	0°C~50°C
Humidity Range	20%~80%
Humidity Range	IP65
Depth resolution	2 Million point cloud
Accuracy	0.2mm
Detection Range	640*400-850*530 (mm)
Frame rate	1 frames per second
Appearance of size	382*136*96 (mm)
Humidity Range of 3D camera	IP64

□ Contact Us □



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