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**DETROIT ROBOTICS**  
COMPLEXITY. AUTOMATED.

# AUTOMATING FOR COMPLEXITY

USING PROGRAMMING HEURISTICS  
AND ADVANCED 5-AXIS MACHINING TECH  
TO SIMPLIFY  
COMPLEX PARTS & PROGRAMS



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# Automating For Complexity

## Heuristics in action

We all use heuristics in our work and home life. A bit of a \$5 word, but a simple enough concept.

Here's a decent definition:

**Heuristics are simple strategies or mental shortcuts that ease the cognitive load of making a decision and finding solutions to complex problems.**

So, although we all rely heuristics every day, a \$500,000 5-Axis robotic cell doesn't. Or rather, can't.

Robots are algorithmic. They think in binary. They don't make judgements or mental leaps. But what they lack in smarts, they make up for in sheer speed and accuracy.

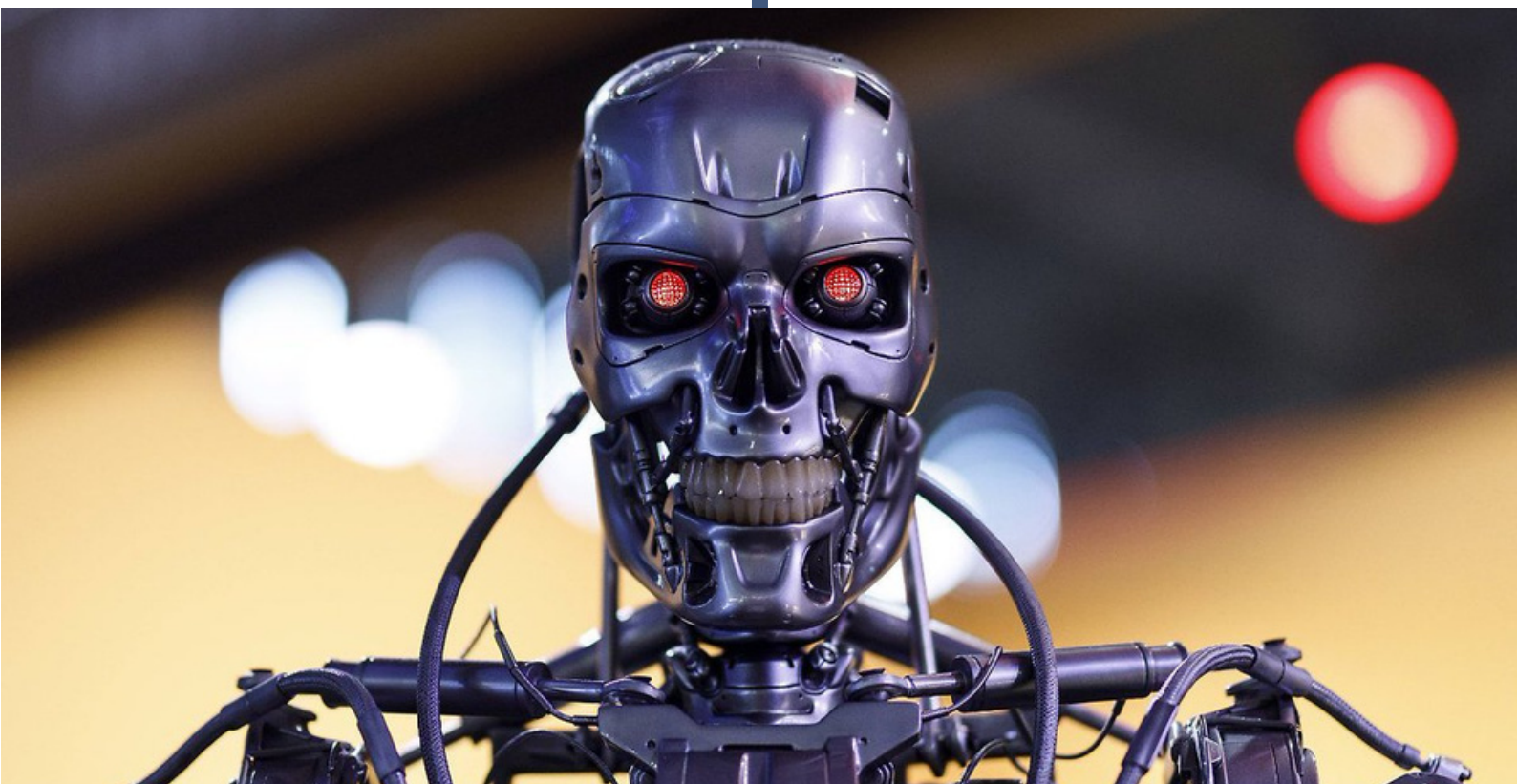
They take the long route, but really darn fast and precise.

**The first machined part, however complex, will come out exactly the same as the 500th or 500,000th. Every. Single. Time.**

Also, they don't need coffee.

The entire concept of AI is based on robots figuring things out for themselves by introducing heuristic cognition. AI is still in the early stages, but we all know how that ends.... #judgementday

Until then, as human overlords, we find new and exciting ways to get robots to do things that are too complex, dangerous, or repetitive for us puny humans.



# Automating For Complexity

## Bots and brains

Amazing things happen when the human (heuristic) mind teams up with the robotic (algorithmic) CPU.

Advances in CNC machine programming has come on by leaps and bounds to keep pace with advances in machining tech.

Heuristics come into play as every unique part shares a (usually high) % of identical features with other unique parts.

At Detroit Robotics, our extensive on-demand program library captures features and geometric similarities and allows the programmer to focus on the unique differences.

**Heuristic programming saves a bunch of time and eliminates error by using proven algorithms.**

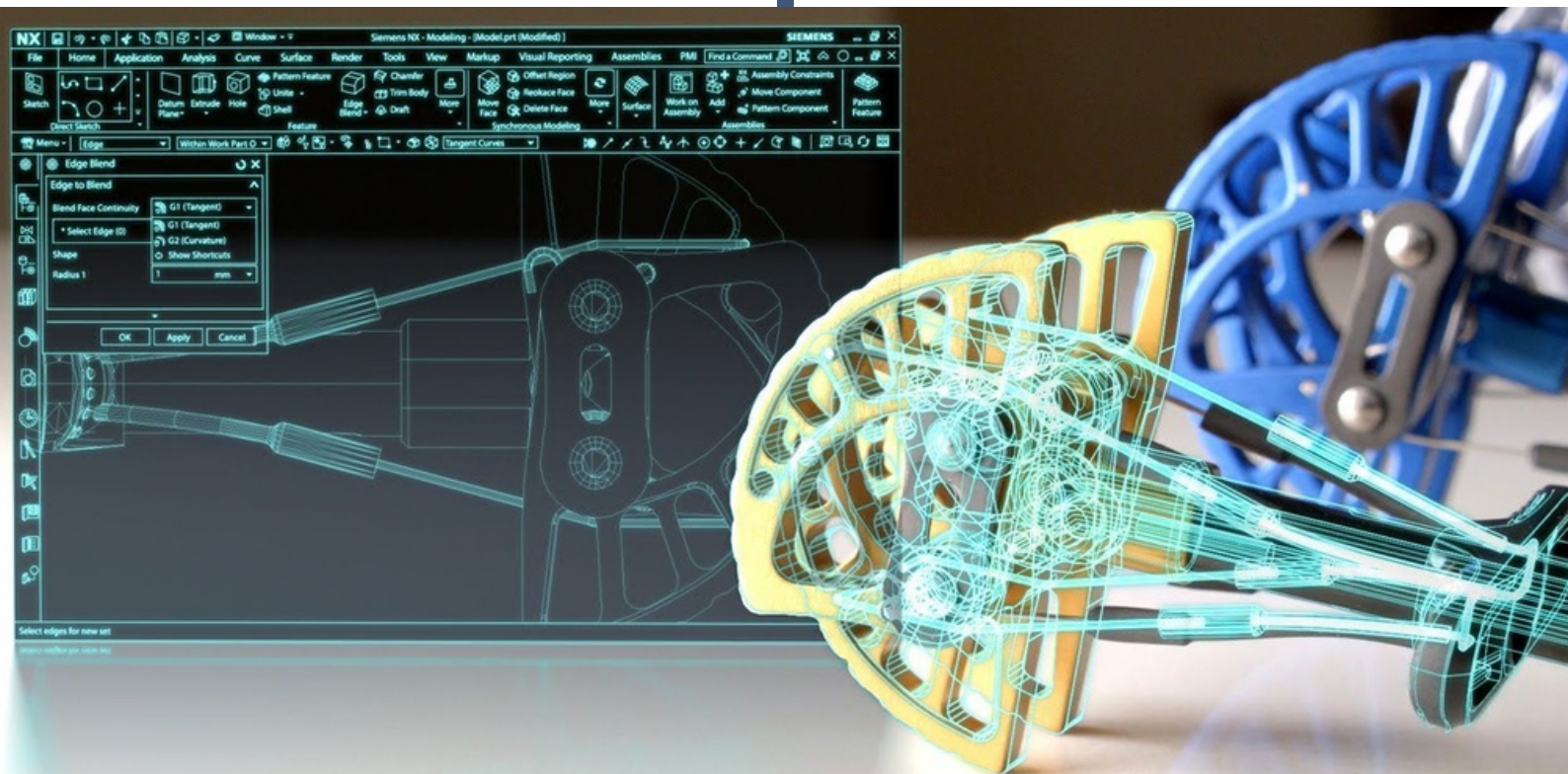
Think: Cut and paste with bells and whistles.

Depending on the level of complexity (i.e. geometry, features, tolerances etc.) the programming component of the total production cycle for each unique part typically varies between 25% to 40%+.

The more this time component is automated, the faster the production cycle.

Detroit Robotics use Siemens the NX platform, generally considered to be the most advanced CNC platform on the market.

The NX integrates with the entire Siemens PLM (Product Lifecycle Management) suite, communicates in real time with other Siemens tools, essentially applying controlled automation to the entire shop floor.





# Automating For Complexity

## The Recipe

Applying heuristics works well other parts of the machining process.

For example, building and maintaining an extensive feeds and speeds library.

This is literally a complete digital record of every successful machining operation. It includes which tools were used and for how long, exact calibrations, and how fast (or long) each machining cells was able to operate and hold conformity.

**Speeds and feeds are recipes. The larger the recipe library, the greater the ability to manage complexity at speed on a diverse cross-section of unique parts.**

Identical parts, one made out of Titanium, the other Aluminum, require two entirely different machining approaches, two different recipes.

Having this useable data greatly accelerates the process and accuracy. Add some clever automation tools into the kitchen, and now you're cooking with fire.

Advanced drills and workholdings, in-cell robotic probes, used in combination with our Hermle HS Flex pallet changer allow us to automate the entire setup for complex multi-axis unique parts.

The fully customizable Siemens NX and PLM platform allows us to build the ultimate automation speeds and feeds library. More importantly, it speaks the same language as our Hermle robotic cells (both Made in Germany.)

The data and the mechatronics function together much like the brain and body. And like the human system if "something happens" they adjust. In a microsecond.



## THE TAKEAWAY

- Advanced automation tools, fully integrated with an extensive speeds and feeds and program library, increases accuracy and reduces time.
- Managing and automating complexity is like climbing mountains or levelling up in video games. The first time may take longer. But, the second and subsequent runs are infinitely faster.
- Successful operations, digitally documented and segmented by unique features geometries, material etc, become the knowledge bank of the enterprise. The harder you work, the smarter you get.
- Like any bank, the value is based on the quality and quantity of the deposits. Automating complexity relies on smart human input as much as advanced robotics.

## RELATED CONTENT



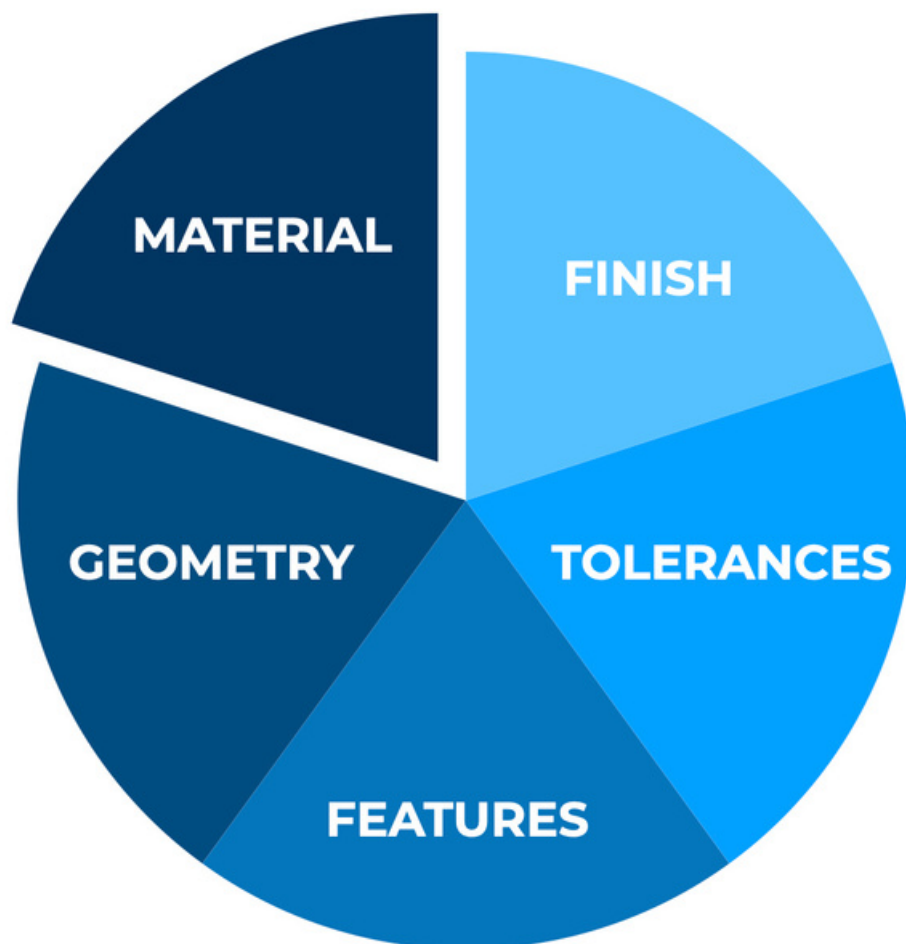
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## THE DATA

The image below is a simple disambiguation that segments all the data from each unique part into definable groups.

When this data is captured, similarities occur at a rate that correlates to the quantity of data inputs. More data, more similarities.

Smart programming heuristics harness this to increase accuracy and save time through automation.





## THE TOOLS



Hermle C-400 5-Axis Cell



Hermle HS Flex Automated  
Pallet Changer



Blum Intelligent Probing

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