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A HANDHELD CNC PRINTING/CUTTING TOOL POWERED BY A GAME CONSOLE

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A handheld CNC printing/cutting tool powered by a game console

This disclosure is relevant to the fields of printing (2D and 3D), assistive robotic technology, augmented reality, gaming, and entertainment.

Making things can be hard. Beyond a creative idea, people often lack the time, knowledge and skill required to turn their ideas into reality. There are assistive tools available, but each product has important tradeoffs that a beginner needs to consider prior to investing:

**Cutting Machines** (e.g. Cricut Maker) are an affordable option, but they are limited to A4 or similar media sizes, and they don’t actively engage the user during the fabrication portion of the creation experience aside from post processing and assembly.

**3D Printers** (e.g. Formlabs Form 2) can produce detailed results, but they are usually limited to producing small parts, often require expensive filaments and resins to use, and fail to actively engage the user during the fabrication portion of the creation experience aside from post processing and assembly. Additionally, while there are affordable models available, many 3D printers can be cost prohibitive for the hobbyist consumer.

**Handheld CNC Machines** (e.g. Shaper Origin) actively assist and engage the user during fabrication and are not constrained to singular media sizes or substrates, but they typically only perform one operation and are cost prohibitive for many households as well.

However, by leveraging the hardware, software, and business model of a game console (specifically the Nintendo Switch), it’s possible to make a handheld, electromechanically assistive prototyping tool that would enable novice users to create colorful three-dimensional mock-ups of their ideas in full scale - faster, easier, and often more affordably than existing solutions.

Refer to the attached figure detailing the system architecture of the proposed solution.

<table>
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<th>A. Tool</th>
<th>B. Cutting Mat</th>
<th>C. Nintendo Switch</th>
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<td>1. Stabilized Tool Body</td>
<td>1. AR Tracking Ring</td>
<td>1. Console</td>
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<td>4. Printer/Cutter Tool Head</td>
<td></td>
<td>4. Infrared (IR) Camera</td>
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</table>
Sequence of Use

1. Setup

1. The Nintendo Switch Console (C1) is secured to the Stabilized Tool Body (A1) using the Adjustable Device Clamp (A2).
2. The Left Controller (C2) and Right Controller (C3) are attached to the Base/Controller Mount (A3).
3. A sheet of Media (B1) is placed onto the Self-Healing Mat (B2).
4. The Tool (A) is placed onto the Cutting Matt (B).

2. Generating an Output

1. The user purchases, creates, or uploads profiles and/or artwork to fabricate using companion software (not pictured).
2. Once a profile/artwork has been selected, it is displayed on the Console (C1) screen.
3. To print artwork onto, or to cut profiles into the Media (B1), the user guides the Tool (A) across the Cutting Mat (B) to modify Media (B1) as instructed by the user interface.

How it Works

1. Movement of the Tool (A) is detected as the Infrared (IR) Camera (C4) continually captures and compares information from the AR Tracking Ring (B3) frame by frame in real time.
2. This information is combined with data from the Gyroscope and Accelerometers (not pictured) located in the Console (C1) and Controllers (C2, C3) to derive the heading, orientation, and speed of the Printer/Cutter Tool Head (A4).
3. That positional and navigational data is then used in three ways:
   a. To communicate the location of the Tool (A) in relationship to the Cutting Mat (B) to the user on the screen of the Console (C1).
   b. To calculate continuously the X and Y distances the Stabilized Tool Body (A1) must compensate for to position the Printer/Cutter Tool Head (A4) precisely.
   c. To signal instructions for the Printer/Cutter Tool Head (A4) to perform at any given time until the media (B1) has been print and cut to specification.

Disclosed by Andy Chick, HP Inc.
A Handheld, Electromechanically Assistive Prototyping Tool

- A1 Stabilized Tool Body
- A2 Adjustable Device Clamp
- A3 Base/Controller Mount
- A4 Printer/Cutter Tool Head

Nintendo Switch

- C1 Console
- C2 Left Controller
- C3 Right Controller
- C4 Infrared (IR) Camera

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