Shrink Reduction by adaptive controlling the process of guided and temperature controlled laser cutting machine

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Abstract

High quality leather is usually recognized by the texture, shine , thickness and color . This high quality leather is extremely sensitive to thermal and abrasive processes. With the implementation of heating or passive inducing machines that can use loss of texture and can cause shrinkage these high quality leathers are depreciated, and the selling price and quality reduces to a great extent. Shrinkage is one of the most common damage that happens with the induction of high temperature of heat. This process of shrikage is not only induced with the effect of direct heating but is a passively induced while shaping or using shine improvement treatment with the help of glass. The presented solution is trying to reduce the output losses of such treatment and the cause of such processes by inducing high speed laser cutting to avoid shrinkage and to let the material expand after cutting. This high speed cutting produces extremely precise and powerful cuts without inducing any changes in sizes in the final cut piece

Literature Survey

R. Siebert[1] Says that laser cutting or mechanical cutting affects the magnetic properties of the cutting edge laser cutting has improved with temperature gradients which improves in deterioration of the magnetic properties This helps in calculating for designing electrical machines.

F. A. Senel [2] In this case the performance of leather cuttings with minimum wastage has been taken. Select a pattern that has to be cut on the piece then with improved image processing technique the pattern is gathered and the cutting process is acquired with minimal wastage.

X. Zhang [3] Uses leather nesting methods for determining the state and size of the leather on which the process is happening and some objectives can be determined through nesting system and the base of the leather and improves cutting speed by reducing the space and space area on the sheet

J. D. Aranda[4] Uses a vision guided system for the whole process of waterjet machining. Where the cutting is made the inspection is made to discover the traces or left over part of the material where the excess pressure is made through the jet distribution process and allows us to understand the process.

Mathematical Modeling

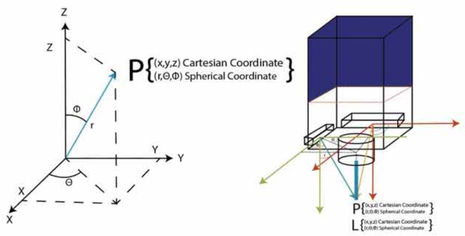

Fig : Final Assembly of the adaptive laser cutting system

Control algorithm not only allows the system to function in the way it has to but allows the system to run with the restricted boundary limits.

Calibration Algorithm

The calibration sequence allows to infer the presence of the frame calibration when the system starts.this is important to bring the positions to exact center position.

Angular Vector Conversion Formula

The calibration sequence allows to infer the presence of the frame calibration when the system starts.this is important to bring the positions to exact center position.

Spherical conversion to cartesian conversion

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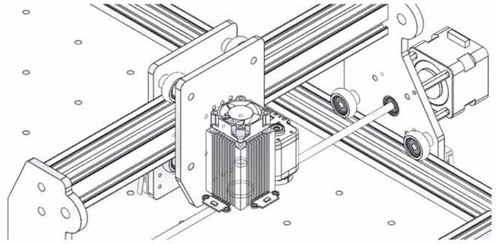
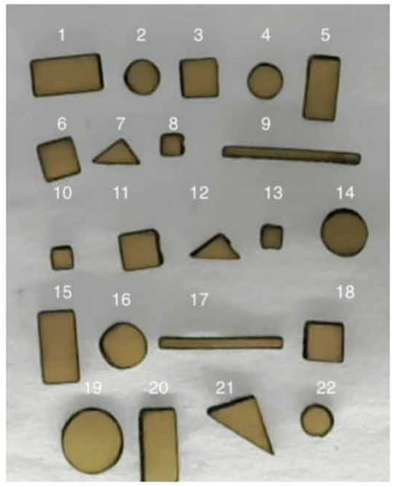


Fig : Vector and angular conversion for distance calculation

SAMPLE	LEATHER TYPE	LEATHER THICKNESS	CLASS	COLOUR	CYCLE
S1	COW	1mm	A	LIGHT BROWN	13
S2	COW	1mm	A	LIGHT BROWN	14
S3	COW	1mm	A	LIGHT BROWN	14
S4	COW	1mm	A	LIGHT BROWN	14
S5	COW	1mm	A	LIGHT BROWN	13
S6	COW	1mm	A	LIGHT BROWN	13
S7	COW	1mm	A	LIGHT BROWN	13
S8	COW	1mm	B	LIGHT BROWN	14
S9	COW	1mm	B	LIGHT BROWN	14
S10	COW	1mm	B	LIGHT BROWN	16
S11	COW	1mm	B	LIGHT BROWN	19
S12	COW	1mm	B	LIGHT BROWN	18
S13	COW	1mm	A	LIGHT BROWN	15
S14	COW	1mm	A	LIGHT BROWN	16
S15	COW	1mm	A	LIGHT BROWN	12
S16	COW	1mm	A	LIGHT BROWN	19
S17	COW	1mm	A	LIGHT BROWN	14
S18	COW	1mm	B	LIGHT BROWN	16
S19	COW	1mm	B	LIGHT BROWN	12
S20	COW	1mm	B	LIGHT BROWN	19
S21	COW	1mm	B	LIGHT BROWN	15
S22	COW	1mm	B	LIGHT BROWN	13

Output and Results

Cut with high precision and extremely low tolerance the output of the feed was not only improved but also improvised with the help of the feedback based system. Resulting in low wastage and high output of the system. The system not only helps in achieving engraving but also sharp cuts throughout the leather surface.



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