The Development of a Colour 3D Food Printing System

A thesis presented in partial fulfilment of the requirements for the degree of

Masters of Engineering

In

Mechatronics

At

Massey University,

Palmerston North, New Zealand

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2012

Abstract

Foods are becoming more customised and consumers want food that tastes great, looks great and is healthy. Food printing, a method of distributing food in a personalised manner, is one way to satisfy this demand. The overarching goal of this research is to develop the ability to print coloured images with food, but this thesis focuses on a subsection of that research. It aims to establish a broad base for future research in the area of food printing, present the design and development of mixing techniques applicable to food printing and finally use image processing to examine the distribution of colour in images likely to be printed.

By developing and testing various components and systems of the existing food printer and by performing a broad review of relevant literature, future researchers will be able to progress topics identified as essential in this field. Photographs of samples mixed using selected mixing techniques were analysed in order to produce qualitative and quantitative results. Six sample images were processed in such a way that colour distribution values were able to be used to estimate the average distances a food printing machine head would have to move between successive deposited volume elements while using discontinuous flow.

The results show each mixing technique tested has advantages and disadvantages, which make them more or less useful for different applications. Testing with static mixers and our oscillating mixer shows they are very capable of achieving complete mixing. However, the static mixing system used would be unable to achieve sufficient contrast between successive volume elements and the oscillating mixer needs development of operating mechanisms before it could be implemented. Mixing with our conical surface mixer showed it was unable to achieve complete mixing, but the novel technique has potential as a mixing technique if additions to the process are made. Results from processing the sample images showed the average distance was 3.26 pixels, which equates to 16.3mm with a 5x5x5mm volume element.

For research to continue, an appropriate mixing technique will need to be selected with regard to the goals and application of the food printing system. The distance between volume elements was deemed acceptable so the oscillating mixer or conical surface mixer would be most appropriate for discontinuous flow while static mixers should be used if a continuous flow is required.

Acknowledgements

Throughout the year spent working on this project I have received lots of support, encouragement and help from various people. I have also appreciated all those people not directly involved in the project who have just been interested enough to ask about my project and then encourage me about it. I would like to thank all these people whole heartedly for what they have contributed in whichever way.

I have appreciated the guidance and suggestions Gourab Sen Gupta has provided as my supervisor. Richard Archer's support and innovative ideas have given direction to the project. Funding from the Riddet Institute has made this project realisable. Brendon Le Comte has made the many hours spent in the office tolerable and enjoyable. His friendly, relaxed, yet hard working nature has helped keep me motivated. Whether it was assisting me in various design processes or educating me about engineering, business and the real world, Tuoc Trinh's words were always useful and/or amusing. Even when flat out with jobs and with a messy workshop, Byron McKillop would make space and time to help me with my questions and machining tasks. I appreciate the sharing of knowledge and resources that Teresa Wegrzyn has demonstrated and general academic advice she has imparted to me. Sandra Kim's friendliness and genuineness always made me feel welcome and she was always willing to help. As temporary member of the team, Fanny Elie-Michel provided fresh motivation and enthusiasm. Having a peer to work with made tasks fun and enjoyable and the work she did was valuable for the project. Clive Bardell, Kerry Griffiths and Ian Thomas would always have a witty or at least a dry and humorous comment ready for when I arrived in the workshop. I appreciate the banter and yarns, but also the hard work they put in to making projects tangible. The proof reading Adam Millen, Nick Allen, and Maureen Butler did for me was truly incredible. With attention to detail and great general care, my words have had more meaning added and are easier to read. Rory Flemmer has been a role model for certain aspects of my engineering self and he was always willing to give a very good suggestion to solve any problem thrown at him. I can't express how thankful I am for the love and support Mum and Dad have given me during this project. Thank you for your continual prayer for me and faith in me.

“Experience is a brutal teacher, but you learn. My God, do you learn.” ― C.S. Lewis

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