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The Development of a Colour 3D Food Printing System

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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.

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

Contents

1	Introduction.....	1
1.1	Background	1
1.2	Existing Food Printer	4
1.2.1	Hardware.....	5
1.2.2	Software	6
1.2.3	Food Printer Issues.....	8
1.3	Specifications	9
2	Review of Food Printing and Rapid Prototyping.....	11
2.1	Existing Food Printing Concepts, Designs and Prototypes.....	11
2.1.1	Conceptual Ideas.....	11
2.1.2	Research Projects with Prototypes.....	18
2.2	Food and Food Dye	24
2.3	Rapid Prototyping Techniques	25
2.3.1	Solid-Based Rapid Prototyping.....	26
2.3.2	Powder-Based Rapid Prototyping.....	29
2.3.3	Liquid-Based Rapid Prototyping	30
3	Review of Mixing and Pumping Techniques.....	33
3.1	Mixing	33
3.1.1	Challenges.....	33
3.1.2	Laminar Mixing	34
3.1.3	Existing Mixing Techniques	34
3.2	Pumping Systems Examined.....	40
4	Dispensing Considerations.....	42
4.1.1	Food batter and Food Dye Containment/Storage.....	42
4.1.2	Fundamental Distribution Methods	43
4.1.3	Controlling Flow	44

4.1.4	Separation of Metering Capability from High Pressure Capability.....	45
4.1.5	Peristaltic Pumps.....	47
5	Design of Mixing Techniques for Food Printing.....	48
5.1	Non-Agitated Mixing.....	48
5.1.1	Static Mixers.....	48
5.2	Agitated Mixing.....	50
5.2.1	Oscillating Mixer Design.....	50
5.2.2	Conical Surface Mixer Design.....	55
5.3	Other Mixing Techniques.....	58
5.3.1	Visual Mixing.....	58
5.3.2	Agitate in place.....	59
5.3.3	Powder and Binder.....	59
6	Image Processing, Machine Control and Data Logging.....	60
6.1	Mixing Sample Image Processing.....	60
6.2	Colour Distribution Image Processing.....	60
6.2.1	Algorithms.....	61
6.2.2	Experimental Setup and Procedures.....	63
6.2.3	Colour Group Information.....	64
6.3	Machine/Printer Control.....	65
6.3.1	Improvements Made.....	65
6.3.2	Improvements Suggested.....	66
6.4	Mass Data Logging Software.....	67
7	Hardware Design.....	68
7.1	Non-Agitated Mixing.....	68
7.1.1	Static Mixer Test Rig.....	68
7.2	Agitated Mixing.....	72
7.2.1	Oscillating Mixer Test Rig.....	72

7.2.2	Conical Surface Mixer Test Rig	74
8	Testing and Results	75
8.1	Non-Agitated Mixing Testing	75
8.1.1	Static Mixing.....	75
8.2	Agitated Mixing Testing	82
8.2.1	Oscillating Mixer Testing	82
8.2.2	Conical Surface Mixer Testing	86
8.3	Reliability of Results	91
8.4	Peristaltic Pump Testing.....	91
8.5	Syringe Pump Testing	92
8.6	Software Testing	96
8.6.1	Spiral Search Algorithm Testing	96
8.6.2	Travelling Salesman Problem Testing.....	96
8.6.3	Results.....	97
8.7	CNC Machine Control and Speed Testing.....	106
8.7.1	Operation and Measurement	106
8.7.2	Malfunctioning.....	107
8.7.3	Single 50mm Movement – Cruise Speed Test.....	107
8.7.4	Five 5mm Movements – Neighbour Depositing Test.....	108
8.7.5	Five 16.3mm Movements – Average Same Colour Distance Test	108
8.7.6	Documentation	108
8.7.7	Results.....	109
9	Conclusions, Recommendations and Discussion.....	111
9.1	Computational Fluid Dynamics	113
9.2	Model Representation Data Formats.....	114
10	References.....	115
11	Appendix (On CD).....	126

List of Figures

Figure 1-1 - Guitar Decorated Cake – Courtesy of Omar de Armas	2
Figure 1-2 - Block Diagram of the System [23] (See Appendix)	5
Figure 1-3 – 3D Food Printer Components- CNC machine, Syringe Pump, Peristaltic Pump, Motor Control Box	6
Figure 1-4 - Down-Sampled Image [24] (See Appendix)	7
Figure 1-5 - GUI for Processing Images and Interfacing With the Food Printer.....	7
Figure 1-6 - Oscillating Flow From Peristaltic Pump While Printing	8
Figure 2-1 – Nanotek’s Method of Producing 3D Multi-Coloured Food Objects [16]	12
Figure 2-2 - Electrolux Moléculaire Concept [27]	13
Figure 2-3 – Philips Food Creation/Printer [29]	14
Figure 2-4 – Virtuoso Mixer Concept [31]	15
Figure 2-5 - Digital Fabricator Concept [31]	16
Figure 2-6 - Robotic Chef Concept [31]	17
Figure 2-7 - Digital Chocolatier 3D CAD Model and Prototype [32]	17
Figure 2-8 - Fab@Home Printing Platform [35]	19
Figure 2-9 - CANDYFAB 4000 [40].....	20
Figure 2-10 – ChocALM [8].....	20
Figure 2-11 - Z Corporation 3D Printed Teeth and RapMan Extruded Chocolate Star [44]	21
Figure 2-12 - TNO High Viscosity Inkjet Technology for Rapid Manufacturing [49].....	22
Figure 2-13 - FoodJet Printer [50]	22
Figure 2-14 - FEF machine with triple-extruder mechanism [51].....	23
Figure 2-15 – Frostruder Time-Pressure Extruder [53]	24
Figure 2-16 - Fused Deposition Modelling Process [59].....	26
Figure 2-17 - Benchtop System [59].....	27
Figure 2-18 - Multi Jet Modelling [59].....	28
Figure 2-19 - Subtractive CNC Rapid Prototyping [65]	29
Figure 2-20 - TheriForm System Schematic [59]	29
Figure 2-21 - Bioplotter Schematic Diagram [59]	31
Figure 2-22 - Buoyancy Force Effect While Plotting [59]	31
Figure 2-23 - Two Methods of Water Distribution used in Rapid Freeze Prototyping [59].....	32

Figure 3-1 - Novel Impeller Designs [81].....	35
Figure 3-2 - Double Helicone Impeller [81]	35
Figure 3-3 - Industrial Banbury Mixer [82].....	36
Figure 3-4 - Rolling Mill/Mixer.....	37
Figure 3-5- Helical Static Mixer Operating Principle.....	37
Figure 3-6 - Plate Profiles	39
Figure 4-1 - Rat-Holing	42
Figure 4-2 - Continuous and Discontinuous Distribution Methods.....	43
Figure 4-3 – Separate metering/Extruding System Utilising Plunger	45
Figure 4-4 – Back-Extrusion - Plunger with Internal Piping.....	46
Figure 5-1 - Kenics Static Mixer and Mixer Elements	48
Figure 5-2 – Original concept model of Oscillating Mixer with Slot Valve to open and close the chamber.....	50
Figure 5-3 – Aluminium and Acrylic Mixing Chamber	51
Figure 5-4 –Mixing Element with Teflon Shaft and Shaft Disc (with O-ring) and Aluminium Function Disc.....	51
Figure 5-5– Mixing Element in a) Mix Position b) In between c) Extrude Position...51	
Figure 5-6 – Conical Surface Mixer Diagram and Mixer Body and Mixer Head	55
Figure 5-7 – Conical Surface Mixer Head and Body with Cap and Compressive Spring.....	56
Figure 5-8 - Mismatched Shape Elastomeric Conical Mixer.....	57
Figure 6-1 - Spiral Searching (Red Square = Current Pixel).....	61
Figure 6-2 – Colour Range with Allowed Difference of 30 units (Combined R, G & B) Centred Around Pixel with RGB Values 60,200,220	62
Figure 6-3 - Sample Output showing the group of black pixels, Final Route and Best Solution History of the OP TSP GA.....	63
Figure 6-4 - Average Size of Colour Groups For Test Images.....	65
Figure 6-5 - Number Of Colours Present In Test Images	65
Figure 6-6 - Digital Electronic Scale and Screenshot of Mass Datalogging Program.....	67
Figure 7-1 - Combination Chamber Configurations: a) 2mm insertion tube b) 9mm insertion tube.....	68
Figure 7-2– Static Mixer Test Rig Schematic and Functional Test Rig	69
Figure 7-3 – Static Mixer Test Rig Safety Test	70
Figure 7-4 – Two Position Encoder	73

Figure 7-5– Chamber Cap with hex screws for shaft positioning	73
Figure 7-6 - Conical Surface Mixer Test Rig	74
Figure 8-1 – Open Top Tube Sample – White to Green.....	77
Figure 8-2 - Mixer Tip part way through run (Mass recorded at same time)	77
Figure 8-3 - Screen Shot of LabView Image Analysis Software.....	79
Figure 8-4 - R, G, B, H, S & L Values’ Usefulness.....	79
Figure 8-5 – 2mm Blue Saturation vs. Distance with slow increase in Saturation from 237mm	80
Figure 8-6 – 9mm Green Test - Saturation vs. Distance with rapid increase in saturation from 442mm.....	80
Figure 8-7 - Method 2 Results for 9mm Tests.....	81
Figure 8-8 - Leakage Water Test Setup	82
Figure 8-9 - Mixture After A) First Plunge B) First Withdraw (Also Residue on Shaft)	84
Figure 8-10- Mixedness vs. No. of Plunges.....	84
Figure 8-11 - Mixture After A) 4 Plunges B) 5.5 Plunges.....	85
Figure 8-12 - After 12 Plunges A) Mixture B) Residue on Shaft.....	85
Figure 8-13 - Oscillating Test Sequence.....	86
Figure 8-14 – Conical Surface Mixer Test Setup	86
Figure 8-15 – A) Extrusion from the second test of the Conical Surface Mixer with white unmixed mixture on right (arrow shows direction of extrusion) B) Highlighted Areas show Regions Analysed.....	88
Figure 8-16 - Colour Values at Extrusion Positions	89
Figure 8-17 – Conical Mixer Body and Head after extrusion (over flow caused by too much mixture).....	89
Figure 8-18 - Inconsistent Mixing	90
Figure 8-19 - Blurry Light Box Photo Of Extrusion.....	91
Figure 8-20 - Head Pressure Effect While Pumping Water.....	92
Figure 8-21 - Food Printer With Syringe Pump On Printing Head	93
Figure 8-22 - Extrusion Line Showing Gap From Air Bubble	94
Figure 8-23 - Extrusion Lines Showing Blobs and Inconsistent Line Thickness.....	95
Figure 8-24 - Group Sizes of 3 (2x2) and 8 (3x3) with Current Pixel Marked 'c'	96
Figure 8-25 - Average Distance Including Fails vs. Allowed Difference (Group Size = 3)	98

Figure 8-26 - Average Distance Including Fails vs. Allowed Difference (Group Size = 8)	98
Figure 8-27 - Average Distance Including Fails vs. Group Size (Allowed Difference = 0)	99
Figure 8-28 - Number of Fails vs. Group Size (Allowed Difference = 0).....	100
Figure 8-29 - Average Distance (Not Including Fails) vs. Group Size (Allowed Difference = 0).....	100
Figure 8-30 - Average Distance Including Fails vs. Group Size (Allowed Difference = 0)	101
Figure 8-31 - Number of Fails vs. Group Size (Allowed Difference = 0).....	101
Figure 8-32 - Average Distance (Not Including Fails) vs. Group Size (Allowed Difference = 0).....	101
Figure 8-33 – Comparison of Average Distances To Closest Pixel of Same Colour for Test Images Using OP TSP GA and SSA.....	102
Figure 8-34 - A) SSA Distances B) OP TSP GA Distances	104
Figure 8-35 - Average of SSA and OP TSP GA Distances for Test Images	105
Figure 8-36 - Motor Control Command and Message Sequence	106
Figure 8-37 - Actual Cruise Speed vs. Set Speed	109
Figure 8-38 - Movement Time for 5mm Move	109
Figure 8-39 - Movement Time for 16.3mm Move	110

List of Tables

Table 1 - Food Batter and Food Dye Specifications.....	9
Table 2 - Print Time Specifications	10
Table 3– Application Matrix for Rotary Pumps [56] (p 3.131).....	40