UTS UNIVERSITY OF TECHNOLOGY SYDNEY

Developing a style at the intersection between analogue and digital animation production

by Simon Rippingale

Thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

under the supervision of Professor Andrew Johnston and Dr Andrew Bluff

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Faculty of Engineering and Information Technology

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CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Simon Rippingale, declare that this thesis, is submitted in fulfilment of the requirements for the award Doctor of Philosophy, in the Faculty of Engineering and Information Technology at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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DEVELOPING A STYLE AT THE INTERSECTION BETWEEN ANALOGUE AND DIGITAL ANIMATION PRODUCTION

ABSTRACT

This research project applies practice-based research methods to explore the intersection between analogue and digital animation production. The aim is to develop a visual style combining the tangible qualities of filming miniature sets and the fluid flexibility of computer-generated animation techniques.

Case studies of two animation projects that developed and refined a motion control camera system are presented. The system involved integration and creative control between key-framed cameras in animation software and physical cameras filming shots on miniature sets using industrial robotic arms. Associated approaches to this hybrid style of animation production workflow are presented, including game engines, 3D printing, point cloud scanning and other techniques. The refined method of hybrid production can form the basis for future productions seeking to build upon this technical and stylistic foundation.

ACKNOWLEDGEMENTS

This research project was supervised by Professor Andrew Johnston and Dr Andrew Bluff.

The research involved significant collaboration with many artists, researchers and technicians from the University of Technology Sydney (UTS) and the Australian animation and visual effects Industry.

The animation case studies were funded and produced in collaboration with the team at Jericho, a branch of the Royal Australian Air Force dealing with research innovation and academic engagement.

Both animation case studies were made in collaboration with artists and researchers Andrew Bluff and Louis Pratt and VFX students Alessandra Grasso, Ben Steek, Mai Pham, Emma Cooney, Carol Amadio and Aaron De Leon at UTS Animal Logic Academy. *Jasper* was made in collaboration with Mark van den Bergen, VFX Supervisor, and Gregory Naud, Lead Animator.

The miniature set shoot for each case study was filmed on a Kuka robotic arm at the Advanced Fabrication Lab, Faculty of Design, Architecture and Building, UTS, in collaboration with robot technicians Tran Dang and Gwyn Jones.

Jarli was co-directed by filmmaker Chantelle Murray and produced by Ryan Greaves, who led a team from animation production company Like A Photon Creative, Brisbane. This case study's story and screenplay were developed with writers Andrew Dillon, Jon Bell and Erica Harrison.

The roles played by key researchers, technicians and artists who made valuable contributions to this research project were:

	Case Study 1: *Jasper*	**Case Study 2: *Jarli***
Andrew Johnston	Research supervisor / Producer	Research supervisor / Producer
Andrew Bluff	Researcher	Researcher
Louis Pratt	Researcher / Art Director	Researcher / Art Director
Tran Dang	Robot Tech	Robot Tech
Gwyn Jones	Robot Tech	Robot Tech
Ben Streek	Researcher / Compositor	
Brycen Horne	Cinematographer	
Alessandra Grasso	Producer / Lighting Artist	
Mark Van den Bergen	VFX Supervisor	
Great Naud	Lead Animator	
Mai Pham	Concept Artist /Animator	
Ryan Greaves		Producer
Chantelle Murray		Co Director
Andrew Dillon		Writer
Jon Bell		Writer
Erica Harrison		Writer
Evan Papageorgiou		Cinematographer
Egan Wessener		VFX Supervisor
Tanya Vincent		Lead Animator
Evan Atherton		Mimic Supervisor

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LIST OF TERMINOLOGY AND ABBREVIATIONS

AACTA	Australian Academy of Cinema and Television Arts
AEAF	Australian Effects & Animation Festival
CG	computer-generated
CGI	computer-generated imagery
fps	frames per second
GPU	graphics processing unit
HDRI	High Dynamic Range Image. An HDRI is a panoramic digital image that covers the full 360-degree spherical field of vision and contains a large amount of data (typically 32 bits per pixel per channel). HDRIs are most often used to emit light into a CG scene.
Hybrid Production Style	shorthand for the animation production style central to this research project. Hybrid production style refers to the compositing of 3D animated characters with footage filmed using miniature sets.
pre-vis	pre-visualisation
RAAF	Royal Australian Air Force
STEM	science, technology, engineering and mathematics
UTS	University of Technology Sydney
VFX	visual effects