

Preface

In 1898, the English writer H.G. Wells introduced the idea of time travel in his novel, *The Time Machine*. Here at the Ikeuchi Laboratory, the University of Tokyo, we have assembled a group of world-class engineers whose work in computer vision lets us travel back in time to the 7th century to the roots of our Japanese culture and to preserve cultural objects through the magic of three-dimensional digital conversion. The Great Buddha of Nara was originally built in the seventh century by order of the emperor, but it was burned down twice during civil wars in Japan. The current Buddha was rebuilt in the sixteenth century. Using advanced computer vision, computer graphics techniques, and historic knowledge from documents preserved in the Todaiji temple, we have reconstructed the Buddha and Buddha palace.

Another example of digital restoration is the work we have done with the Bayon Temple in Angkor Thom, Cambodia. This temple, which unites the Buddhist outlook of ancient India with Khmer tradition, is one of the masterpieces of historic architecture. Unfortunately, the structure is worsening day by day, and there is a high possibility of its collapsing in the near future. By using newly developed sensors and software, we have digitized this huge temple and obtained 3D digital data for restoration purposes.

Why are these restoration projects necessary? Unfortunately, many valuable objects that form part of our cultural heritage have been decayed by weathering and natural disasters such as Indonesia's recent earthquake. Other objects have been destroyed through man-made disasters such as the Taliban's destruction of the great Barmian Buddha in Afghanistan. But we can preserve our irreplaceable cultural heritage in 3D digital form for future generations using today's IT technologies. Images derived from 3D digital technology deepen our understandings of our cultural heritage and increase the identity and dignity of each nation.

This book presents an overview of the results of research on information and communication technologies devoted to digital preservation. It summarizes recent research results accumulated since the publication of our previous book,

Modeling From Reality. Our new book consists of four parts. Part I introduces our cutting-edge range sensors for scanning cultural objects. Part II presents our software algorithm, which integrates a large amount of range data into a unified mesh model. Part III explains techniques to analyze the color of the surfaces of cultural objects for preserving their “true surface color.” Part IV provides examples of how to utilize these digital data for the “time-machine.” We hope our readers enjoy their journey to this restored world.

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