

The Mantegna frescoes in Padua: computer assisted puzzle solving and recolorization

Massimo Fornasier

Department of Mathematics

Technische Universität München, Germany

In 1944, near the end of World War II, an allied bombing campaign destroyed the Eremitani church in Padua, Italy. The church was famous among art lovers for its magnificent frescoes, which included a series by the early renaissance painter Andrea Mantegna (1431-1506). Over 88.000 small pieces of painted plaster, of an average area of only 4-5 square centimeters, had been lovingly collected and conserved after the bombing; together, they accounted for less than 80 square meters – only a very small fraction of the area covered by the frescoes originally. From 1992 onwards, art conservation experts attacked the task of cleaning and photographing every piece, sorting them and hoping to reconstruct at least some fragments. The herculean task seemed hopeless – until mathematics came to the rescue. We developed an approach that made it possible, for each small piece of plaster that still showed an element of the design of the fresco, to find where it belonged exactly. The resulting very fragmented and mosaic-like reconstruction of the color scheme of each fresco was then used, via another algorithm, to fill in the color information for the whole fresco.