An unusual phenomena

Computer imaging analyses

If, indeed a template was used to create the brick patterns we might expect to find identical patterns in different parts of the painting, or in different paintings, as the template was shifted from place to place, or painting to painting. Here, a standard tool in forensic image analyses - digital cross-correlation - has been applied (3).

Method:
Step 1: The areas of brick patterns were hand-segmented in a high-resolution image of the painting.
Step 2: Edge enhancement was used to make the mortar lines of the brick patterns of equal thickness.
Step 3: The vertical mortar lines provided the most relevant information since the horizontal mortar lines were found to be strikingly consistent throughout the painting. Therefore a morphological filter was used to eliminate the horizontal lines in the brick patterns.
Step 4: Cross-correlation analysis of two images was performed by plotting correlation as a function of spatial shift in order to search for significant matches.
Step 5: Statistical analysis was applied to determine significance of correlation.

Conclusions

The horizontal lines of the brick patterns were found to be very consistent throughout the painting suggesting the use of a guide, such as a ruler. In addition, cross-sectional analyses of the mortar lines demonstrate a conventional paint build-up and appearance. No significant regions of cross-correlation or subtle breaks in the pattern were revealed with image analysis that would indicate multiple pressings of a template. A few small regions of moderate cross-correlation are not considered significantly higher than that which would occur by chance if executed by hand. This does not rule out the possible use of a single impression. Preliminary inter cross-correlation analysis with the similar brick patterns in The Keizergracht and the Westerkerk in Amsterdam, painted a few years earlier, has not revealed significant correlation ruling out the idea that the same template was used to render the brick patterns in both pictures. It is anticipated that the application of computer-vision, image-analyses, and pattern recognition will provide new ways to look at how pictures are constructed.

Selected references


Acknowledgement

The authors are grateful to Ed Brandon for supplying the high resolution image of The Oudezijds Voorburgwal and the Oude Kerk.