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# Geographically weighted bidimensional regression on the 17<sup>th</sup>-century map of a castle town in Japan

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## Abstract:

Previous studies on historical maps have frequently used the bidimensional regression method to analyze the distortion of the maps. In many cases, however, the residuals of bidimensional regression are spatially auto-correlated. Of course, we can understand map distortions by those spatially auto-correlated residuals. At the same time, however, there is a possibility for another approach, which is to expand the bidimensional regression method to one consisting of spatial auto-correlations. Geographically weighted regression is a famous example of such a regression method that consists of spatial auto-correlations. Thus, a new method, called geographically weighted bidimensional regression, is proposed in this study. This regression method was applied to the 17<sup>th</sup>-century map of a castle town in Japan. The results indicate that spatial auto-correlation of residuals no longer exists. In addition, local parameters of the new method can describe map distortions directly. Ordinary bidimensional regression divides map distortions into global distortions and local distortions, which means that the ordinary technique assumed global distortions. The new method, however, can explore map distortions without assuming global distortions.