**Statistical approach in analysis of Inca architecture – in a search for Inca measurement system.**

Doctoral candidate: Anna Kubicka

Department of History of Architecture Arts and Technology

Wroclaw University of Science and Technology

During expansion of the empire from about 1430 to the Spanish conquest in 1532 (chronology based on John Rowe[1]) Inca created infrastructure as well as small and large settlements to lunched a massive construction program which marks their presents across the Andean region. In housing design exists a basic form which is: single-room structure. Based on older central Andean building tradition this form was used to create a diversity of settlement types across the Inka domain. They created a variation of form by making small but important changes which allowed to enrich a use and function [2]. All of these facts makes their architecture highly standardize.

 However, information about Inca units of measurement is quite abundant and unsystematised. In the same time, Inca architecture, town planning and skills in engineering works required a system of measurement at least as exact as that in use in ancient Mediterranean cultures. Some ideas about Inca mathematics abilities were exposed during analyses of *quipu.* Anarithmetic ideas used by Incas must have included at a minimum: addition, division into equal parts, division into simple unequal fractional parts, multiplication of integers by integers and fractions [3].

The culture background justifies the aim of this research which is to verify the hypothesis on the functioning of the imperial system of length measurement, which was used by Incas during measurement and construction process of the complex of Machu Picchu. Confirmation of this hypothesis will attest to the fact that architectural investment generally associated with the Inca Pachacuti were constructed based on metrological system imposed and supervised by imperial engineers. At the same time equally interesting is a falsification of this hypothesis, where particular groups of periodically working (*mitayoq*) brought with them not only the local tradition of a stonework but also local measurements. Differences in stonemasonry were identified by Adine Gavazzi and they can suggest such a distinction. However at this stage of research is not sure if the reason is a local tradition or function and prestige of building.

The research implements the use of statistical methods such as the *cosine quantogram* and *Monte Carlo* simulation to analyses an architecture of the Machu Picchu site, based on measurements collected by 3D lesser scanner. As far as the research method is concerned, a statistical model of *cosine quantogram* was successfully employed during the analysis of architectural sites of Mediterranean culture as well as European medieval urbanism [4] and it was not applied in regard to pre-Columbian archaeology to such extent.

The search for a basic unit of measure in this particular site has some difficulties especially concerns a level of foundation and walls erection system. For this reason, three potential models are created and will be further discussed.

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3. M. Ascher, R.Ascher, Mathematics of the Incas: Code of the Quipu, New York 1981.
4. J. Pakkanen, “Deriving ancient foot unit from building dimensions: a statistical approach employing cosine quantogram analysis”, in: Burenhult, G. and J. Arvidsson (eds.)

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