Image Analysis of Khmer Inscriptions

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Abstract: Stones were the material used in history to record important events and preserving information on culture and technologies. Khmer inscriptions from historical perspective are the primary hard-copied documents demonstrating ancient civilization of Cambodia. Our knowledge in ancient architectures, cultures, religions, and literature of the Cambodian people is based in particular on Khmer inscriptions. Unfortunately, over several centuries, the inscriptions lost their quality resulting from weathering and aging of the material, and from human activities, including looting and ignorance of people. The textual information and geometric shapes of the script were significantly damaged. Restoring the inscriptions and making them readable again, at least for experts, are challenges to computational sciences.

Starting from 3D scanning data of the original inscriptions, we apply image-processing methods and software Gigamesh recently developed at IWR to extract information on inscriptions, using in particular information on curvatures of the surface of the stones. We obtain a segmented and reduced representation of the inscription in 2D.

This presentation is going to describe the mathematical concepts how to use the 2D geometric structures to analyze the ancient Khmer script. We define features of the characters and their combinations, which are as simple as possible and invariant with respect to translation, rotation, and scaling. Khmer ancient characters are represented by networks of lines and curves with connecting a set of nodes. We have designed filtering algorithms to identify the characters, by extracting geometric information like number and type of nodes, endpoints and junctions and controlling curvatures.

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