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# Proposal for a complete 3D surface reconstruction using images from a scanning electron microscope (SEM)

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**Abstract:** A three-dimensional model enables the development of accurate solutions to have more information about the thickness, texture, and characteristics of small-size samples for education and metrology applications. This project proposes an idea to obtain a complete 3D surface reconstruction using the application of Pollen 3D for the scanning electron microscope (SEM) images with high magnification. The main objective is to have a set of images of the complete 360° rotation of the sample with a robot inside the chamber of the SEM. Simulation SEM images with Blender (open source application) are proposed for results validation. © 2023 The Author(s)

## 1. Description of the propose

This proposal divides the project into four main modules, Robot calibration, automatic image acquisition, auto-calibration with SEM model, and reconstruction with 2-100 images, as shown in Figure 1.

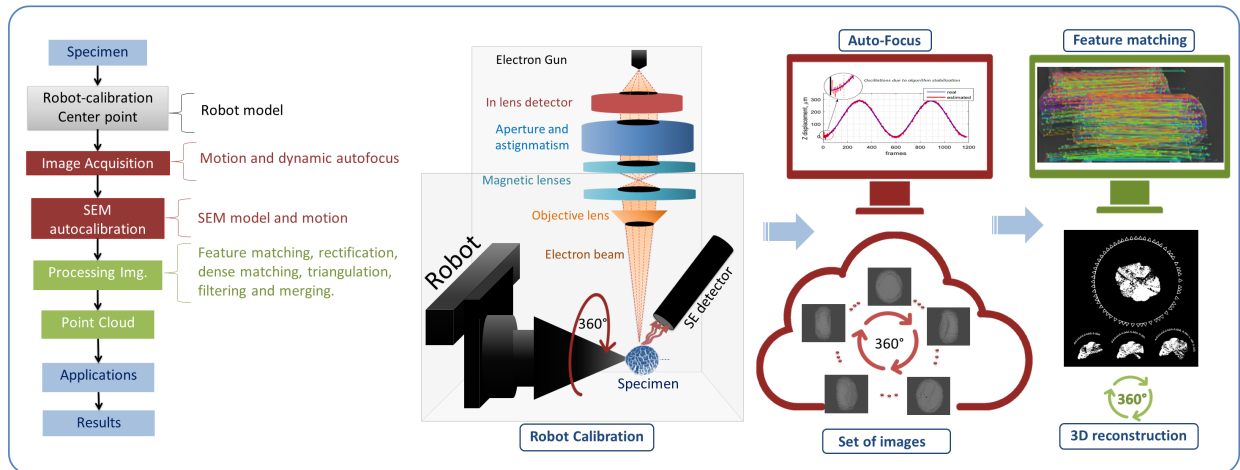


Fig. 1. Proposal for a complete 3D surface reconstruction using images from SEM; the main modules are robot calibration, automatic acquisition, auto calibration, and 3D reconstruction.

There are many applications for 3D surface reconstruction from SEM images ( Mountains from Digital Surf, France; 3DSEM from Zeiss, Germany; MeX from Alicona, Austria; etc.). The current commercial ones are mainly geometry based, and they use the values of sample platform rotation taken directly from the SEM interface [1, 2, 3, 4, 6]. Nonetheless, SEM experience indicates that these values accuracy is no longer guaranteed because

of errors in sample positioning concerning the sample eucentric point with mechanical platforms on a micro-scale. To overcome this problem, this proposed is based on the auto-calibration achieved in the application Pollen 3D [5]; this platform will be used to reconstruct the 3D point clouds, and this project proposes a complete application from image acquisition.

## 2. Acknowledgements

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