

## BATANGAS STATE UNIVERSITY

The National Engineering University

Alangilan Campus



## V. HOMOGENEOUS TRANSFORMATION MATRIX

Homogeneous transformation matrices combine both the rotation matrix and the displacement vector into a single matrix. Homogeneous transformation matrices combine both the rotation matrix and the displacement vector into a single matrix. You can multiply two homogeneous matrices together just like you can with rotation matrices. Homogeneous transformation matrices enable us to combine rotation matrices (which have 3 rows and 3 columns) and displacement vectors (which have 3 rows and 1 column) into a single matrix. They are an important concept of forward kinematics.

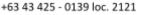
**Augmentation Matrix** 

Homogeneous transformation matrix, denoted as H and it also has a superscript for reference frame and subscript for the projected frame. The matrix shown is the formula in obtaining the homogeneous transformation matrix, it has a 4x4 matrix that composed of 3x3 Rotation matrix combined with 3x1 position vector and 1x4 augmentation column composed of 0 0 0 1.

The following figures are the calculation of homogeneous transformation matrix of articulated manipulator.

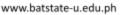












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$$^{9}H = ^{9}H_{2}^{1}H_{3}^{2}H$$

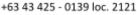
## Supplementary Video about the Homogeneous Transformation Matrix of **Articulated Manipulator**

To further understand how to get the Homogeneous Transformation Matrix, here is a supplementary video explaining how to get it.

(https://drive.google.com/file/d/1CfDKDjL68Fsk21M647CW5w04 R1Caz6K/view?usp=s haring)











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