Research Question –

Optimal Design of Manipulator to detect stresses in Greenhouse Crops

* סעיפים 1-2 חלוקת השאלת מחקר לשני חלקים (הזרוע יושבת על פלטפורמה ניידת, אז סעיף 1 זה רק לזרוע וסעיף 2 זה לזרוע והפלטפורמה. סעיף 3 תלוי בהתקדמות)

# Optimal Manipulator Kinematics – No platform

## Optimal Manipulator for First Point in the Plant

## Optimal Manipulator for Second Point in the Plant

## Optimal Manipulator that Integrate Both Points

## Vice Versa for another several points and for all plant feasible point

## What the differences\ Changes of adding points

# Optimal Manipulator Kinematics – with platform

## Same as 1

## How many DOF added?

## How adding DOF changed the Design of the manipulator

## Can we take a picture while the platform is moving?

# Optimal Manipulator Dynamics - - Depends on progress

## How Manipulator Reach effects on the stability of the platform?

* איך יתבצע בפועל: 4 – אבנה סביבה לסימולציה של החממה עם תכנון של זרועות שונות ב-GAZEBO

5 – הגדרת בעיית האופטימיזציה – המספרים לאילוצים רק מספרים לדוגמה, צריך עוד להחליט

# Simulation:

## Create Simulation of the greenhouse

## Simulation of the Manipulators Designs

# Optimization

## Objectives:

### Minimum Time to take picture (cycle time)

### Minimum ~~Cost~~ DOF

### More?

## Constrains:

### Plant Height (reach) 🡪 must reach to all plant close area

### ~~Mobile Stability (For - Optimal Manipulator Kinematics – with platform and forward)~~

### Size (For - Optimal Manipulator Kinematics – with platform and forward) 🡪 Mobile Platform width & length Limits

### Mass 🡪 No More than 35Kg (including Control)

### Accuracy 🡪 min 0.1 mm

### Repeatability 🡪 min 0.1 mm

### Pay Load 🡪 5Kg

### ~~Safety to Human 🡪 Cobot, Noise up to 80dB~~

### ~~Operating Voltage & Current 🡪 Up to 24V and 15A~~

### ~~Compatibility to greenhouse conditions 🡪 up to 50 Celsius degrees, IP-54 min~~

## Solution\Concepts

### Number of Joint (DOF)

### Types of Joint

### Order Of joints

### Length of links

# Other:

## How much time it will take to make photo?

## What to positions that needed to be reached?