Automated Phenotyping of Corn

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PHENOTYPING
What is it and why do we do it?

Environment  INTERACTION  Genotype

Phenotype
PHENOTYPING
What is it and why do we do it?

• Relate Gene mapping to phenotyping
• Accurately predict crop yields or per-plant-yield (PPY)
• Positive correlation found between grain weight and diameter of corn stalks
Current Phenotyping Methods

<table>
<thead>
<tr>
<th>Methods</th>
<th>Disadvantages</th>
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</thead>
<tbody>
<tr>
<td>1. Maize is harvested as shown in picture.</td>
<td>• Slow</td>
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<tr>
<td>2. Length of maize is hand measured.</td>
<td>• Time consuming</td>
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<tr>
<td>3. Maize is then broken in half and diameter is measured.</td>
<td>• Highly susceptible to human error</td>
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</tbody>
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Automated Corn Image Analysis

ACIA

Type 1
Cross-section

Type 2
Length
Images Being Analyzed
Methods
Type 1 & 2: Cross-Section & Length

Color is selected from a template.
Methods
Type 1 & 2: Cross-Section & Length

Image is threshold using color values obtained.
Methods
Type 1 & 2: *Cross-Section & Length*

Connected components are applied to identify and isolate corn images.
Methods
Type 1: *Cross-Section*

Area of white section and kernel are computed.

Average diameter is computed.
Methods
Type 2: Length

The start of the corn is identified using RGB color tolerances

Once identified, the stubs on the top and bottom are removed.

Length and Diameter in pixels are calculated.
Graphical User Interface
Graphical User Interface
Graphical User Interface
Graphical User Interface
# Benefits of using ACIA

<table>
<thead>
<tr>
<th>Benefits</th>
<th>How?</th>
</tr>
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<tbody>
<tr>
<td>Higher Productivity</td>
<td>• Mundane jobs can be processed by a computer, leaving user with more time to analyze data instead of collecting data.</td>
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<tr>
<td>Highly Accurate</td>
<td>• RGB color and pixel data are highly accurate compared to more traditional methods of measurement.</td>
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| Lower Cognitive Load      | • Easy to use
• Everything can be done with just a click of a button
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• Jordon Pace
• Thomas Lubberstedt
• Baskar Ganapathysubramanian
Questions
And/or
Comments?