

User Manual for LSSA_CAU 1.7¹

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¹This is user manual for an interactive 3d point clouds analysis software for body measurement of livestock with similar forms of cows or pigs.

²www.cau.edu.cn

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Preface

LSSA_CAU: An interactive 3d point clouds analysis software for body measurement of livestock with similar forms of cows or pigs. An updated LSSA_CAU version can be downloaded freely from <https://github.com/LiveStockShapeAnalysis> to livestock industry and research.

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Acknowledgements

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- I'll also like to thank PCL² development team for their awesome point cloud processing library.
- I'm deeply indebted my parents, colleagues and friends for their support and encouragement.

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http://clst.cau.edu.cn/art/2018/8/8/art_31197_580629.html

¹http://clst.cau.edu.cn/art/2018/7/18/art_31196_579219.html

²<https://pointcloudlibrary.github.io/>

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Overview of this software

As increasing number of studies for shape measurement purposes in livestock farming by using consumer depth cameras, many software have been developed in order to measure livestock conformation. However, many of these softwares were designed only for specific livestock or body part of specific livestock with very limited body measurements. To be more flexible and general compared to the current software provided in the literature, an interactive software LSSA_CAU is developed to estimate body measurements of livestock based on 3d point clouds data. Livestock with similar forms of cows or pigs and standing with her head forward is assumed for designing algorithm used in LSSA_CAU. This software provides a set of tools for loading, rendering, segmenting, pose normalizing, measuring point clouds data of whole body surface of livestock in a semiautomatic manner.

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System Requirements and Installation

2.1 System Requirements

Here's what it takes to run LSSA_CAU on your PC or tablet:

- Processor: 1 gigahertz (GHz) or faster processor or SoC.
- RAM: 2 GB or more
- Hard disk space: 100MB or more
- Graphics card: OpenGL 2.0 or later
- OS: Windows 7+.
- OS type: 64-bit.

2.2 Installation

Go to release site¹ download the latest version. You can follow the steps below to install LSSA_CAU from setup.exe file.

1. Double click the setup.exe.
2. A dialog box will appear. See 2.1. Follow the instructions to install the software.
3. The software will be installed. You can now open the application from the Start menu (Windows 7) or the Start Screen (Windows 8). See 2.2. You will see 2.3 if installation are correct.

¹<https://github.com/LiveStockShapeAnalysis/LiveStockShapeAnalysis-Software/releases>

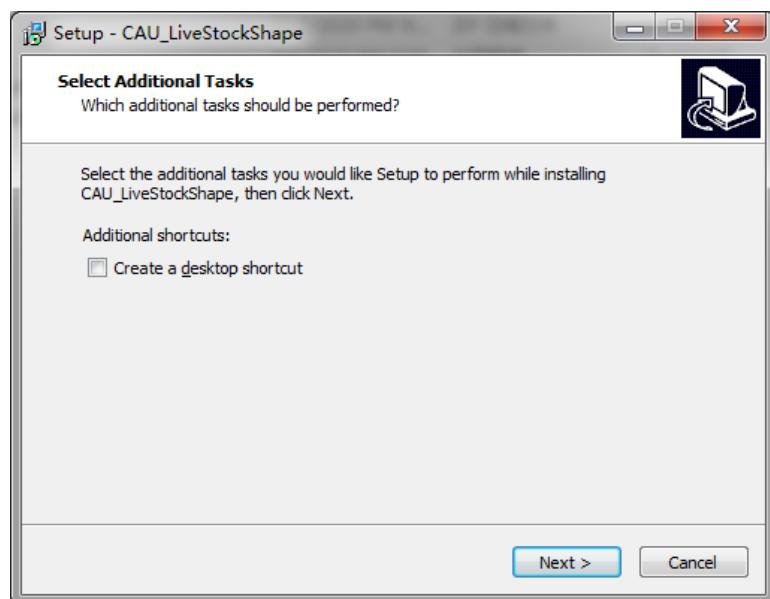


Figure 2.1: Installation wizard.

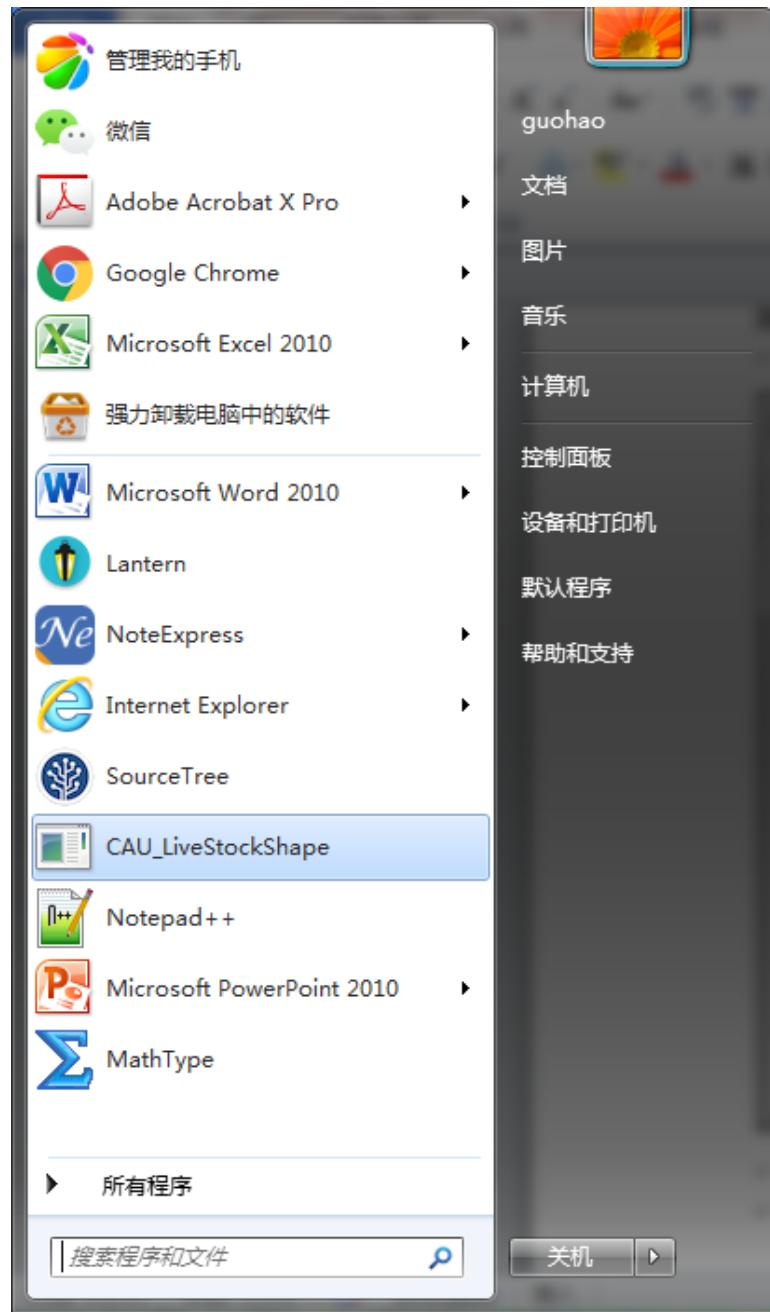


Figure 2.2: Start menu.

2. SYSTEM REQUIREMENTS AND INSTALLATION

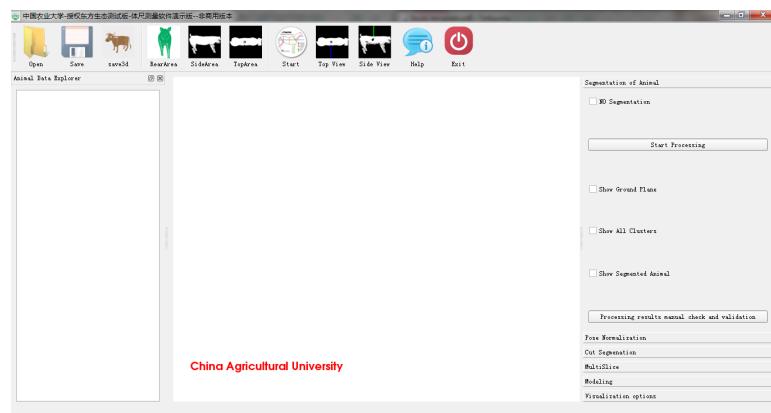


Figure 2.3: Installation successful.

3

Usage

3.1 User interface

3.1.1 Command Line Interface (CLI)

TODO¹

3.1.2 Graphical User Interface

Below is an example of a GUI of LSSA_CAU.

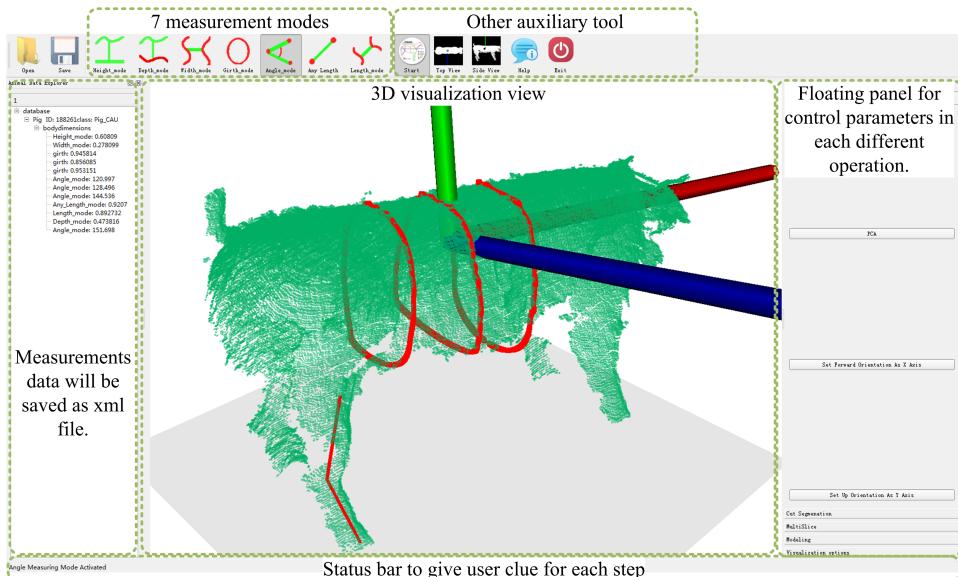


Figure 3.1: Graphical user interface.

¹In order to support some IOT applications, we need to run application on server side.

3.2 Input and data preprocessing

3.2.1 Input data

Without loss of generality, we assume that the input point clouds S mainly consist of one livestock standing on a planar ground plane with possible parts of other livestock facilities. As figure 3.2 show. You can load new 3d point cloud data (pcd format only at this moment) by menu tool.

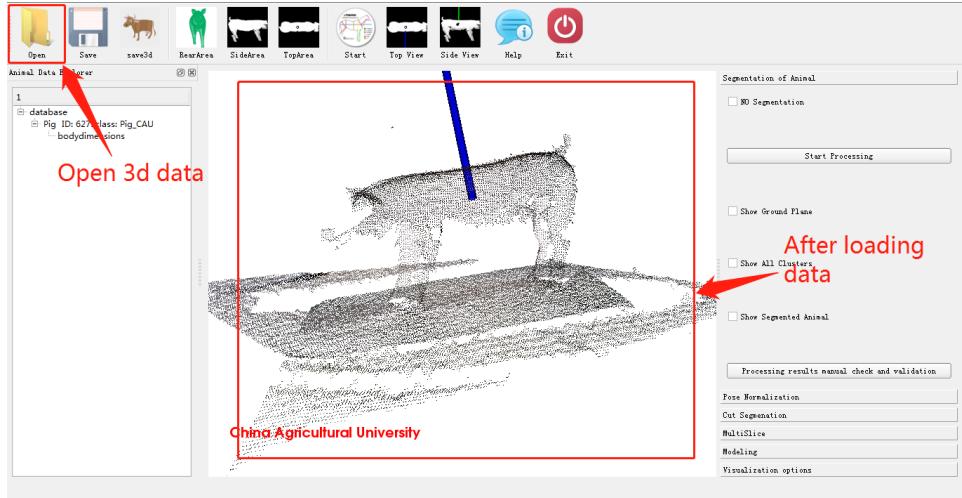


Figure 3.2: Load new 3d data (pcd format only at this moment) .

3.2.2 Data preprocessing automatically

At this moment, data preprocessing include segmentation, pose normalization(support most of four legs livestock), landmark detection(only support pigs at this moment). As figure 3.3 show. You can start the preprocessing step by start button. After less than one minutes(depend on your computing power of your computer), you can see the preprocessing results.

3.2.3 Data preprocessing validation manually

In order to make sure the following measurement legal, user could validate output by clicking validation button manually. As figure 3.4 shows. If user input YES, the system will hide coordinate system, original 3d data. Otherwise, the system will clear the input. Automatic way need to be developed in the future.



Figure 3.3: Start preprocessing and its results .

3.3 Interactive body measurement

3.3.1 Measurement mode switch

To make LSSA_CAU more versatile, We divide livestock body measurements into following 7 major mode in terms of number of anatomical points needed when measuring:

1. Perpendicular distance from a point to ground plane, like height;
2. Circumference of cross-section parallel to the y-z plane, like heart girth;
3. Distance between two points along y axis, like chest width;
4. Distance between two points along z axis, like body depth;
5. Distance between two points along x axis, like body length;
6. Distance between two points, customized measurement may useful;
7. Angle defined by three points, like foot angle;
8. TODO more useful mode will be added in the future.

User can switch on/off all the mode and switch each mode on/off by click the corresponding tool button. As figure 3.5 shows. After setting right mode, user can choose points by SHIFT+LEFT button and do the measurement. Meanwhile, the system will save the results and show the results on the left side of window. As figure 3.6 shows. User can edit the measurement name by double click the name of measurement.

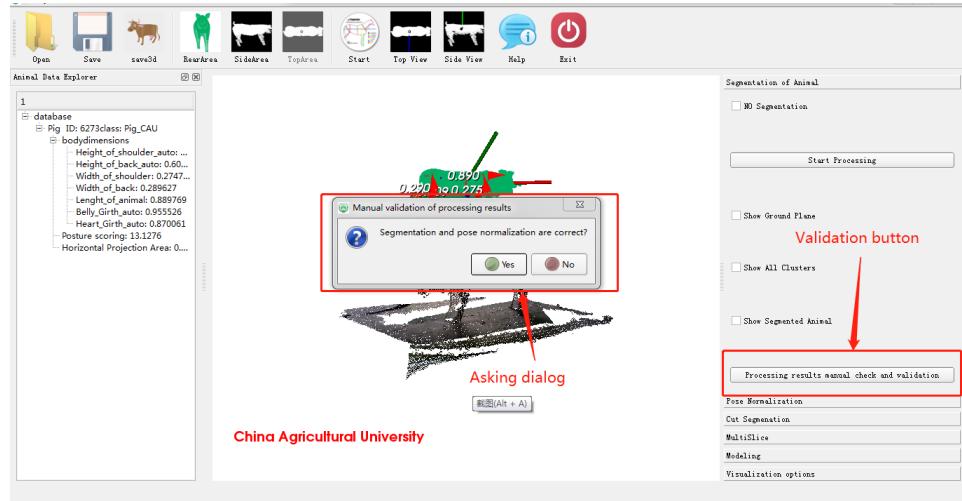


Figure 3.4: Validation of preprocessing results.

3.3.2 Area measurement

Since the area of front, back and side are related with weight of animal. We also support the area measurement mode. This feature is still under testing. As figure 3.7 shows.

3.3.3 Volume measurement

TODO

3.4 Data management

3.4.1 Body measurement results saving

The system support save the body measurement results into xml file. Which can easily be used for other data analysis. As figure 3.8 shows.

3.4.2 Preprocessing 3d results saving

The system support save the 3d results into pcd or ply file. The 3d results only contains the livestock. User can save the 3d results by click the *save3d* tool.

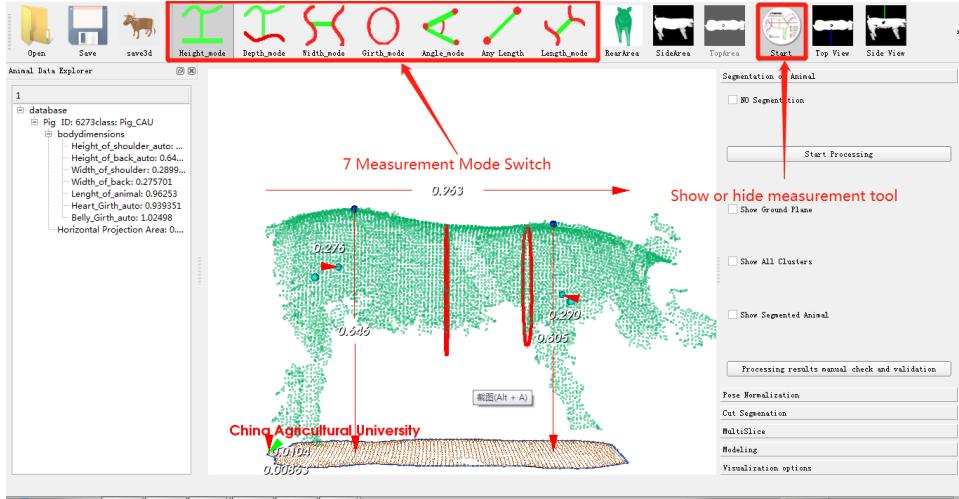


Figure 3.5: Switch on/off all the mode and switch each mode on/off by click the corresponding tool button.

3.5 Visualization options

3.5.1 3D view options

As figure ?? shows. There are following options you can change the 3d view of system.

1. Top and side view setting tool;
2. Switch on/off some elements, such as pose normalization results, original data, axes.
3. TODO More control will come.

3.5.2 2D tree view options

As figure ?? shows. User can refresh the tree view by clicking the root of tree. Which is useful when user edit the name of body measurement.

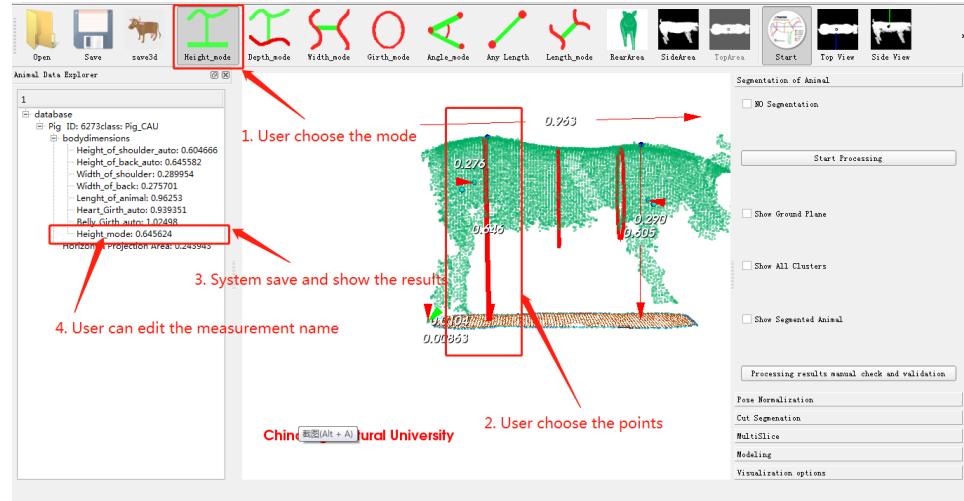


Figure 3.6: Manual measurement and edit the measurement name.

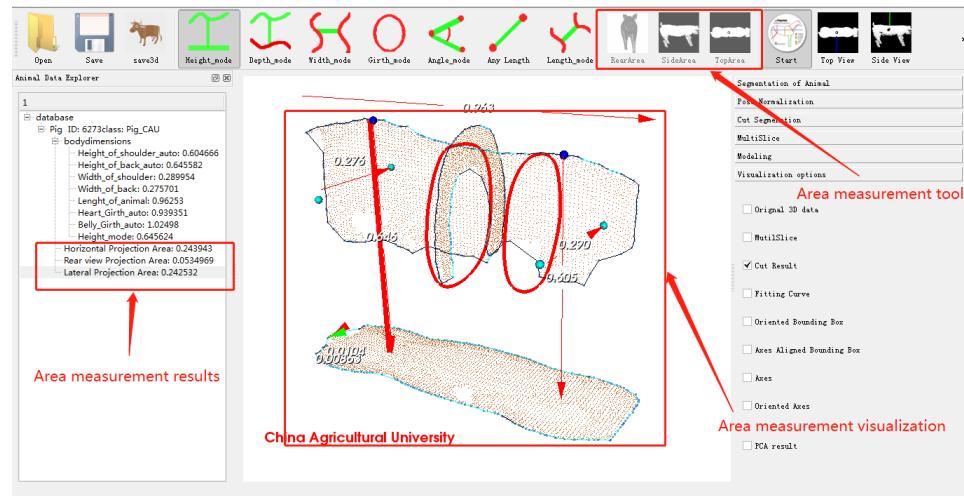


Figure 3.7: Area measurement mode.

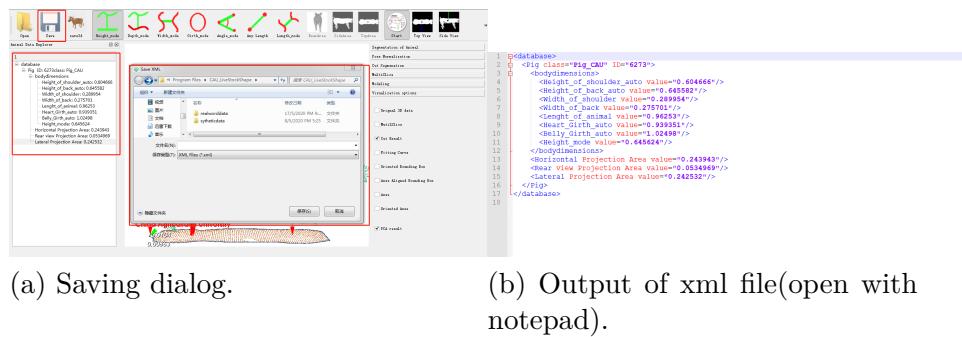


Figure 3.8: Body measurement results saving.