Gmail

François Decarie <frank.decarie@gmail.com>

draft description for patent application

9 messages

johnorange@sympatico.ca <johnorange@sympatico.ca> Mon, Feb 19, 2024 at 6:23 PM
To: charles.grant@cwgrant.ca, François Decarie <frank.decarie@gmail.com>
Cc: FTrippier@ft-lawyers.com

Following my discussion with Francois I have tried to put together a description of how the image processing functions. I have attached my initial description and also a flow chart. If Francois has produced a better schematic then I will use that and adjust the description.

I cannot emphasise too much the urgency of this. We have to file the application on Friday and if I do not get the information needed to describe a plausible image processing system the application may be vulnerable in the future.

I have medical appointments tomorrow (Tuesday) afternoon but am otherwise available to discuss.

Regards

2 attachments

schematic draft.pdf
119K

description of image processing.docx
16K

François Decarie <frank.decarie@gmail.com> Tue, Feb 20, 2024 at 6:53 AM
To: johnorange@sympatico.ca
Cc: charles.grant@cwgrant.ca

Hello Mr Orange,

I have made a few corrections, I tried keeping the same style of writing and keeping this a brief overview, I also included a simplified diagram.

The described camera system, illustrated in Figure 7, plays a pivotal role in our data collection and analysis framework. It comprises a video camera, referred to as Camera 34, that captures a continuous flow of video frames. These frames are processed by a Graphical Processing Unit (GPU), equipped to run sophisticated image processing and data extraction algorithms to estimate the weight of pigs as they traverse through Station 10.

Each video frame is initially subjected to object detection algorithms that isolate the pig's image from any irrelevant background elements. We employ state-of-the-art object detection methods like the YOLO (You Only Look Once) series, known for their real-time processing capabilities and accuracy.

Frames where pigs are obscured or only partially visible, due to overlap with another pig or being cropped out of the frame, are excluded to maintain the integrity of the data.

After object detection, segmentation is performed on each identified pig. This is essential in frames with multiple subjects to ensure individual assessment. We utilize the YOLOv7 model, known for its precision in segmentation, within a PyTorch environment. This model also facilitates the counting of pigs by tracking their movement through Station 10, using the centroid's movement as a reliable passage indicator.

Following segmentation, the system employs pose detection algorithms to evaluate each pig's stance within Station 10. This step is crucial as it highlights specific postural features relevant for accurate weight estimation.

The subsequent phase involves feature extraction, where key characteristics indicative of a pig's mass are identified. Notable features include the curvature of the spine, the widths of the hips and shoulders, the total pixel count of the pig's image, and its color or intensity. Insignificant regions for weight estimation, such as the area from the neck to the snout and momentarily visible limbs from an overhead perspective, are deliberately excluded.

The extracted features are then input into a neural network designed for image regression to ascertain the pig's weight. Keras, a versatile neural network framework, is utilized for this purpose, featuring an input layer, an output layer, and multiple hidden layers, each configured to suit the task's complexity.

The neural network's output provides an estimated weight for each pig, which is correlated with data from a secondary camera system for individual identification. This integration facilitates the categorization of pigs based on their growth phase or readiness for market, aiding in the comprehensive management of the herd's health and development.

To fine-tune the network, the training phase includes the use of four load cells and a high-frequency (200 Hz) Analog to Digital Converter (ADC) within Station 10, ensuring a precise weight correlation. The load cells' data is processed alongside the image analysis, providing a reference weight for each pig, thereby enhancing the system's overall accuracy and reliability. The scale is removed after the training phase is complete.

François
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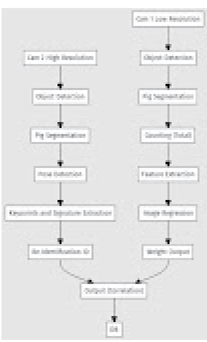


Screenshot_20240220_054127_Chrome.jpg
201K

johnorange@sympatico.ca <johnorange@sympatico.ca> Tue, Feb 20, 2024 at 9:08 AM
To: François Decarie <frank.decarie@gmail.com>
Cc: charles.grant@cwgrant.ca

Thank you Francois, I will work to incorporate that in to the overall description. One question:- how does the pose detection indicate that for example, the front of the pig is elevated or the rear elevated.

I should get the draft back to you later today and then we can finalise.

Regards

[Quoted text hidden]

François Decarie <frank.decarie@gmail.com> Tue, Feb 20, 2024 at 9:27 AM
To: johnorange@sympatico.ca

Hello,

Yes, See attached for a visual example
(Photo taken from Pexels), our subject and keypoints are different.

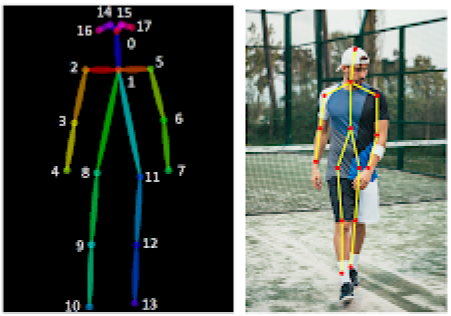
The input to this Neural Network is the image, the output is the keypoints.

The keypoints are points on the subject that will move with it. Our use a custom labeled dataset for training.

It is important to note that the if some of the keypoints are not visible (when the snout is down) or when a human is sideways and has an arm occluded, those particular keypoints are returned has "not visible". There is no inference on elevation. It is only aware of the 2 dimensional direction in terms of angles.

These keypoints are use for templating weights as a safety measure but are also used for identifying the part of the animal that has the signature patch of hair we use for finger printing.

[Quoted text hidden]



1_JUXSz1Vy5S7OiIz26DPgew.png
1265K

johnorange@sympatico.ca <johnorange@sympatico.ca> Tue, Feb 20, 2024 at 9:46 AM
To: François Decarie <frank.decarie@gmail.com>

Can you provide me with a schematic similar to that showing the overall processing of data included in your first email today but in the training mode. Where does the scale output get used?

[Quoted text hidden]

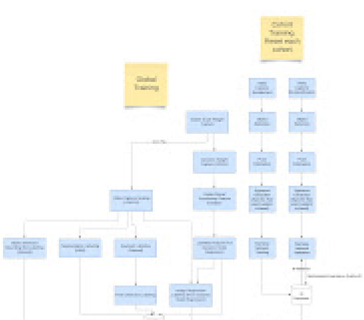
François Decarie <frank.decarie@gmail.com> Tue, Feb 20, 2024 at 2:09 PM
To: johnorange@sympatico.ca, charles.grant@cwgrant.ca

Mr Orange,

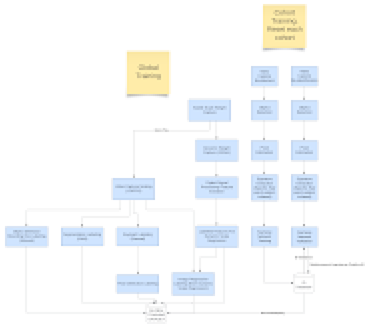
see attached. Same diagram in two different formats.

François
[Quoted text hidden]

2 attachments



Training Diagram.jpeg
390K



Training Diagram.png
416K

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johnorange@sympatico.ca <johnorange@sympatico.ca> Tue, Feb 20, 2024 at 3:22 PM
To: François Decarie <frank.decarie@gmail.com>, charles.grant@cwgrant.ca

Thank you Francois. I need to digest this and will probably have more questions. Are you around tomorrow?

[Quoted text hidden]

François Decarie <frank.decarie@gmail.com> Tue, Feb 20, 2024 at 3:36 PM
To: johnorange@sympatico.ca
Cc: charles.grant@cwgrant.ca

Absolutely yes. We where at the barn at the research station today and planning to go on Thursday. This is reading week for U of M so it's the ideal time to get this hashed out properly.

François
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François Decarie <frank.decarie@gmail.com> Thu, Jan 23, 2025 at 4:19 AM
To: Gina Decarie <decarie@gmail.com>

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