

WHAT IS CLAIMED IS:

- 1 1. An insect sortation system, comprising:
2 an insect pathway defining an interior volume having an inlet and an outlet,
3 wherein an approach zone of the insect pathway is defined adjacent the inlet, a classification
4 zone of the insect pathway is defined adjacent the outlet, and a singulation zone of the insect
5 pathway is defined between the approach zone and the classification zone;
6 a puff back region defined adjacent the inlet;
7 a puff forward region defined adjacent the outlet; and
8 an imaging system disposed adjacent the insect pathway and configured to
9 image insects on the insect pathway.
- 1 2. The insect sortation system of claim 1, further comprising:
2 a computing device comprising a memory and a processor configured to:
3 receive image data from the imaging system; and
4 determine positions of at least some of the insects on the insect
5 pathway based on the image data.
- 1 3. The insect sortation system of claim 2, wherein the computing device
2 is further configured to classify one or more insects when the one or more insects are in the
3 classification zone.
- 1 4. The insect sortation system of any one of claims 2 or 3, wherein each
2 of the puff back region and the puff forward region comprises a puff system that comprises:
3 one or more puff outlets extending
4 an air source that provides an air flow to the one or more puff outlets; and
5 a control valve disposed between the air source and the one or more puff
6 outlets, and that controls the air flow to the one or more puff outlets.
- 1 5. The insect sortation system of claim 4, wherein the computing device
2 is further configured to control the control valve in each puff system based on the positions of
3 the insects to separate a single insect from the insects when the insects are in the singulation
4 zone.
- 1 6. The insect sortation system of any one of claims 1-5, wherein the
2 insect pathway defines a rectangular cross section, with a height and a width selected to
3 correspond to a representative insect of the insects.
- 1 7. The insect sortation system of any one of claims 1-6, wherein the puff
2 back region is configured to blow insects towards the inlet and the puff forward region is
3 configured to blow insects towards the outlet.

- 1 8. The insect sortation system of any one of claims 1-8, further
2 comprising a shutter disposed within the singulation zone, the shutter comprising a track and
3 a door that is moveable between an open state and a closed state.
- 1 9. The insect sortation system of claim 8, wherein, when the door is in the
2 open state, the insects can freely move along the insect pathway.
- 1 10. The insect sortation system of any one of claims 8 or 9, wherein, when
2 the door is in the closed state, the insects are prohibited from moving along the insect
3 pathway.
- 1 11. The insect sortation system of any one of claims 8-10, wherein, when
2 the door is in the closed state, the interior volume is divided into a first volume and a second
3 volume.
- 1 12. The insect sortation system of any one of claims 8-11, wherein the
2 insect pathway comprises:
3 a floor on which the insects move,
4 a ceiling disposed above the floor; and
5 a pair of walls extending between the floor and the ceiling.
- 1 13. The insect sortation system of claim 12, wherein the floor is formed
2 from a translucent material.
- 1 14. The insect sortation system of claim 13, further comprising one or
2 more lighting elements disposed below the floor and positioned to provide light through the
3 translucent material.
- 1 15. The insect sortation system of any one of claims 12-14, wherein the
2 ceiling is formed from a transparent material.
- 1 16. The insect sortation system of any one of claims 1-15, wherein:
2 the imaging system is a position tracking imaging system configured to
3 capture images of the insects for position tracking of the insects along the insect pathway;
4 and
5 the insect sortation system further comprises an insect classification imaging
6 system configured to capture images of the insects for classification of the insects within the
7 classification zone.
- 1 17. An insect sortation method, comprising:
2 receiving image data from an imaging system disposed adjacent to an insect
3 pathway, the image data representative of one or more insects on the insect pathway;

4 determining positions of one or more insects with respect to a plurality of
5 zones of the insect pathway based on the image data; and
6 causing movement, by a puff system, of at least one insect of the one or more
7 insects based on a position of the at least one insect with respect to the plurality of zones.

1 18. The insect sortation method of claim 17, wherein the imaging system
2 comprises one or more cameras.

1 19. The insect sortation method of any one of claims 17 or 18, wherein the
2 plurality of zones comprise an approach zone disposed adjacent to an inlet of the insect
3 pathway, a classification zone disposed adjacent to an outlet of the insect pathway, and a
4 singulation zone disposed between the approach zone and the classification zone.

1 20. The insect sortation method of claim 19, wherein causing the
2 movement, by the puff system, of the at least one insect comprises:
3 determining that the at least one insect has remained within the approach zone
4 beyond a maximum amount of time; and
5 instructing the puff system to puff a burst of air that moves the insects toward
6 the inlet.

1 21. The insect sortation method of claim 19, wherein causing the
2 movement, by the puff system, of the at least one insect comprises:
3 determining that a quantity of insects within the approach zone exceeds a
4 maximum quantity of insects for the approach zone;
5 instructing the puff system to puff a burst of air that moves the insects toward
6 the inlet.

1 22. The insect sortation method of claim 19, wherein causing the
2 movement, by the puff system, of the at least one insect comprises:
3 determining that the at least one insect has remained within the classification
4 zone beyond a maximum amount of time; and
5 instructing the puff system to puff a burst of air that moves the insects toward
6 the outlet.

1 23. The insect sortation method of claim 19, wherein causing the
2 movement, by the puff system, of the at least one insect comprises:
3 determining that the at least one insect has remained at a particular position
4 within the classification zone beyond a maximum amount of time; and
5 instructing the puff system to puff a burst of air that moves the insects toward
6 the outlet.

- 1 24. The insect sortation method of claim 19, wherein causing the
2 movement, by the puff system, of the at least one insect comprises isolating the at least one
3 insect from the one or more insects.
- 1 25. The insect sortation method of claim 19, wherein
2 the imaging system comprises one or more cameras; and
3 the method further comprises:
4 receiving additional image data from the imaging system when the at
5 least one insect is located within the classification zone; and
6 identifying one or more characteristics of the at least one insect based
7 on the additional image data; and
8 classifying the at least one insect based on the one or more
9 characteristics.
- 1 26 . The insect sortation method of claim 25, wherein the one or more
2 characteristics comprise a head, a body area, a body length, a tail, or an antenna.
- 1 27. The insect sortation method of any one of claims 25-26, wherein
2 classifying the at least one insect comprises classifying the at least one insect based on sex,
3 health, species, genus, or size.
- 1 28. The insect sortation method of any one of claims 25-27, further
2 comprising causing movement, by the puff system, of the at least on insect based on
3 classifying the at least one insect.
- 1 29. A non-transitory computer-readable storage device comprising
2 computer-executable instructions that, when executed by a computer system, cause the
3 computer system to perform operations comprising:
4 receive image data from an imaging system disposed adjacent to an insect
5 pathway, the image data representative of one or more insects on the insect pathway;
6 determine positions of one or more insects with respect to a plurality of zones
7 of the insect pathway based on the image data; and
8 causing movement, by a puff system, of at least one insect of the one or more
9 insects based on a position of the at least one insect with respect to the plurality of zones.
- 1 30. The non-transitory computer-readable storage device of claim 29,
2 wherein the plurality of zones comprise an approach zone disposed adjacent an inlet of the

3 insect pathway, a classification zone disposed adjacent an outlet of the insect pathway, and a
4 singulation zone disposed between the approach zone and the classification zone.

1 31. The non-transitory computer-readable storage device of claim 30,
2 wherein causing the movement, by the puff system, of the at least one insect comprises:
3 determining that the at least one insect has remained within the approach zone
4 beyond a maximum amount of time; and
5 instructing the puff system to puff a burst of air that moves the insects toward
6 the inlet.

1 32. The non-transitory computer-readable storage device of claim 30,
2 wherein causing the movement, by the puff system, of the at least one insect comprises:
3 determining that a quantity of insects within the approach zone exceeds a
4 maximum quantity of insects for the approach zone; and
5 instructing the puff system to puff a burst of air that moves the insects toward
6 the inlet.

1 33. The non-transitory computer-readable storage device of claim 30,
2 wherein causing the movement, by the puff system, of the at least one insect comprises:
3 determining that the at least one insect has remained within the classification
4 zone beyond a maximum amount of time; and
5 instructing the puff system to puff a burst of air that moves the insects toward
6 the outlet.

1 34. The non-transitory computer-readable storage device of claim 30,
2 wherein causing the movement, by the puff system, of the at least one insect comprises:
3 determining that the at least one insect has remained at a particular position
4 within the classification zone beyond a maximum amount of time; and
5 instructing the puff system to puff a burst of air that moves the insects toward
6 the outlet.

1 35. The non-transitory computer-readable storage device of claim 30,
2 wherein causing the movement, by the puff system, of the at least one insect comprises
3 isolating the at least one insect from the one or more insects.
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