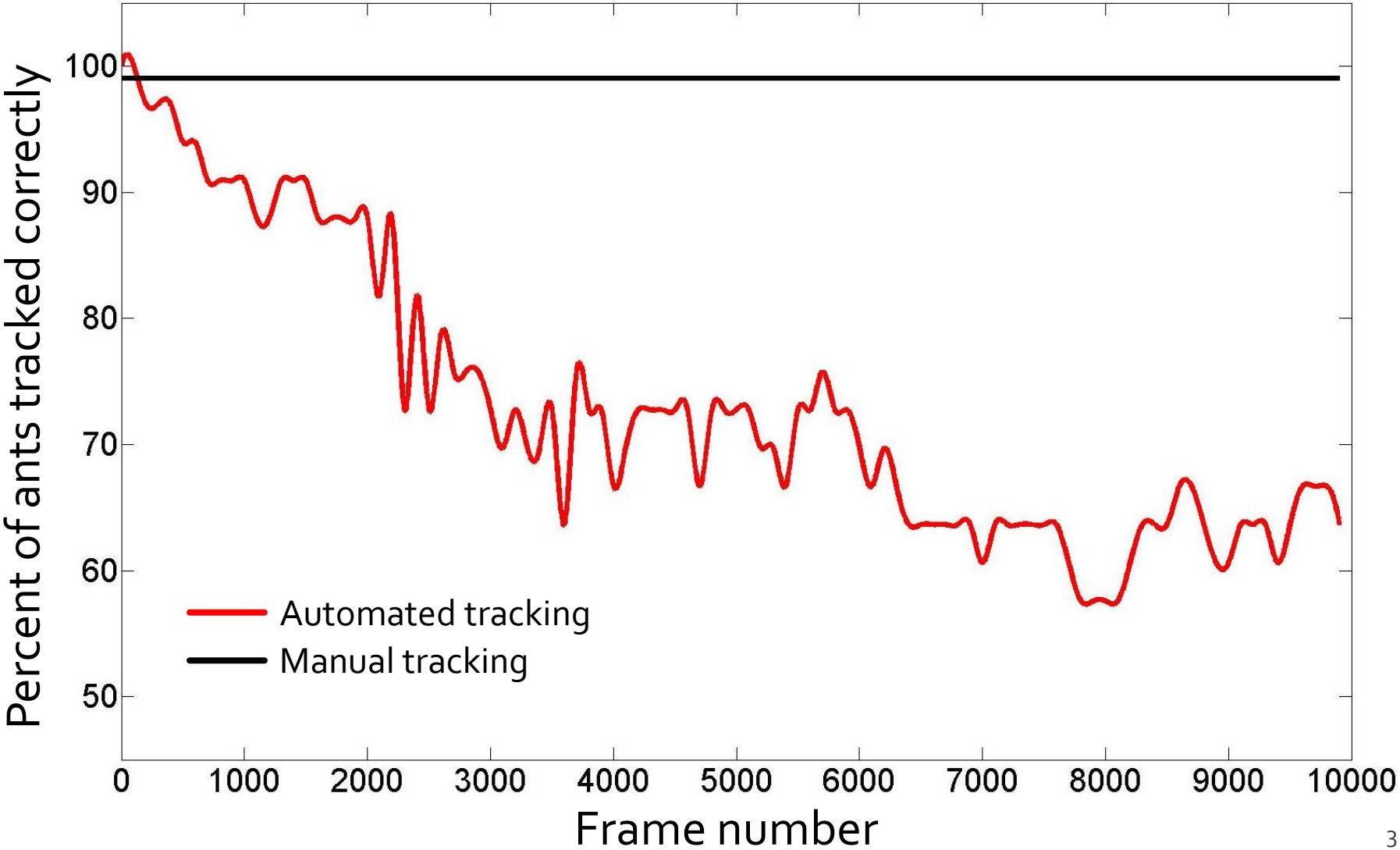
Corey Poff, Advisor: Min C. Shin

Interactive Ant Tracking

Why study ants?

"Karl Marx was right, socialism works, it is just that he had the wrong species" – E.O. Wilson

Preexisting methods



Semi-automated tracking—method 1

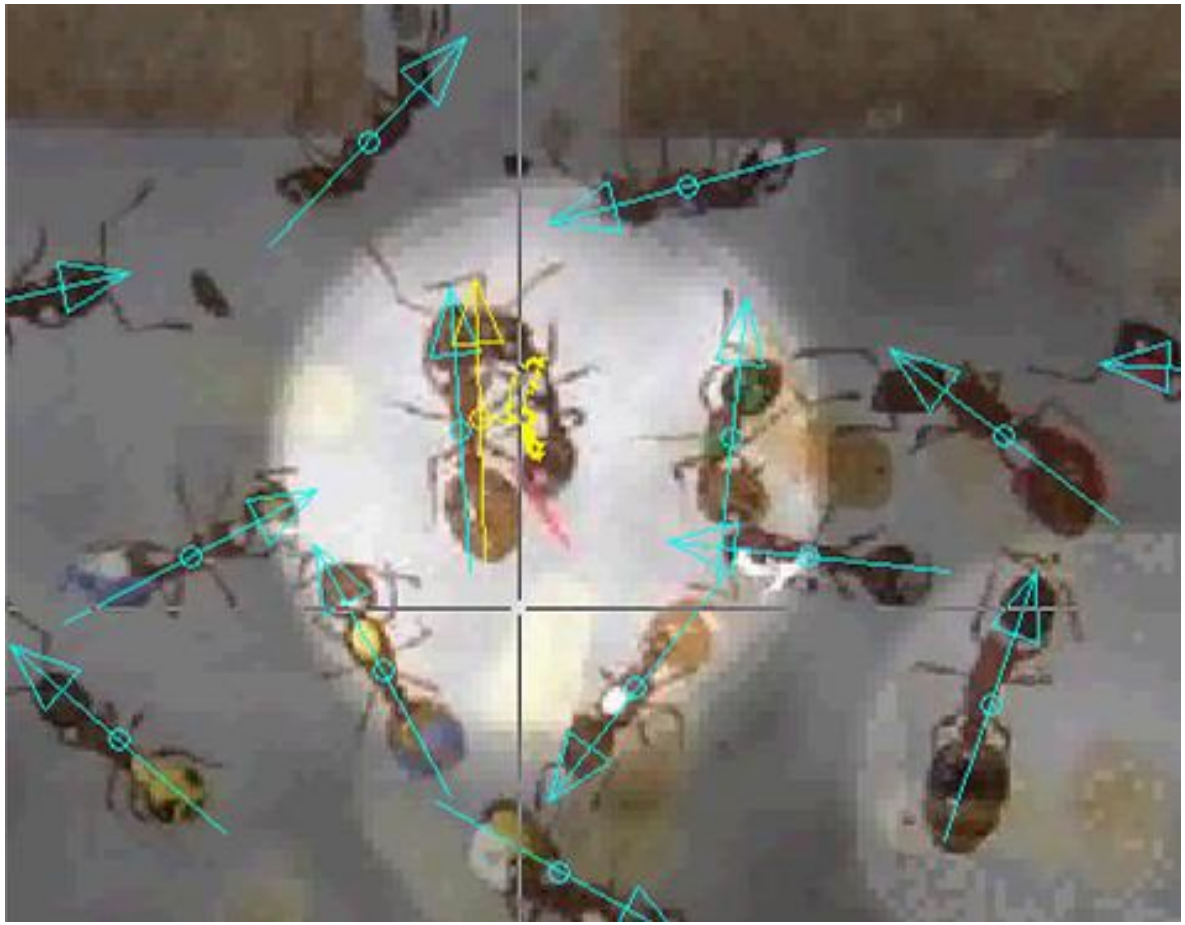
1. **Automatic tracking**
2. Automatic error detection
3. Manual error correction

Semi-automated tracking—method 1

After automatic tracking process

1. Automatic tracking
2. **Automatic error detection**
3. Manual error correction

Semi-automated tracking—method 1

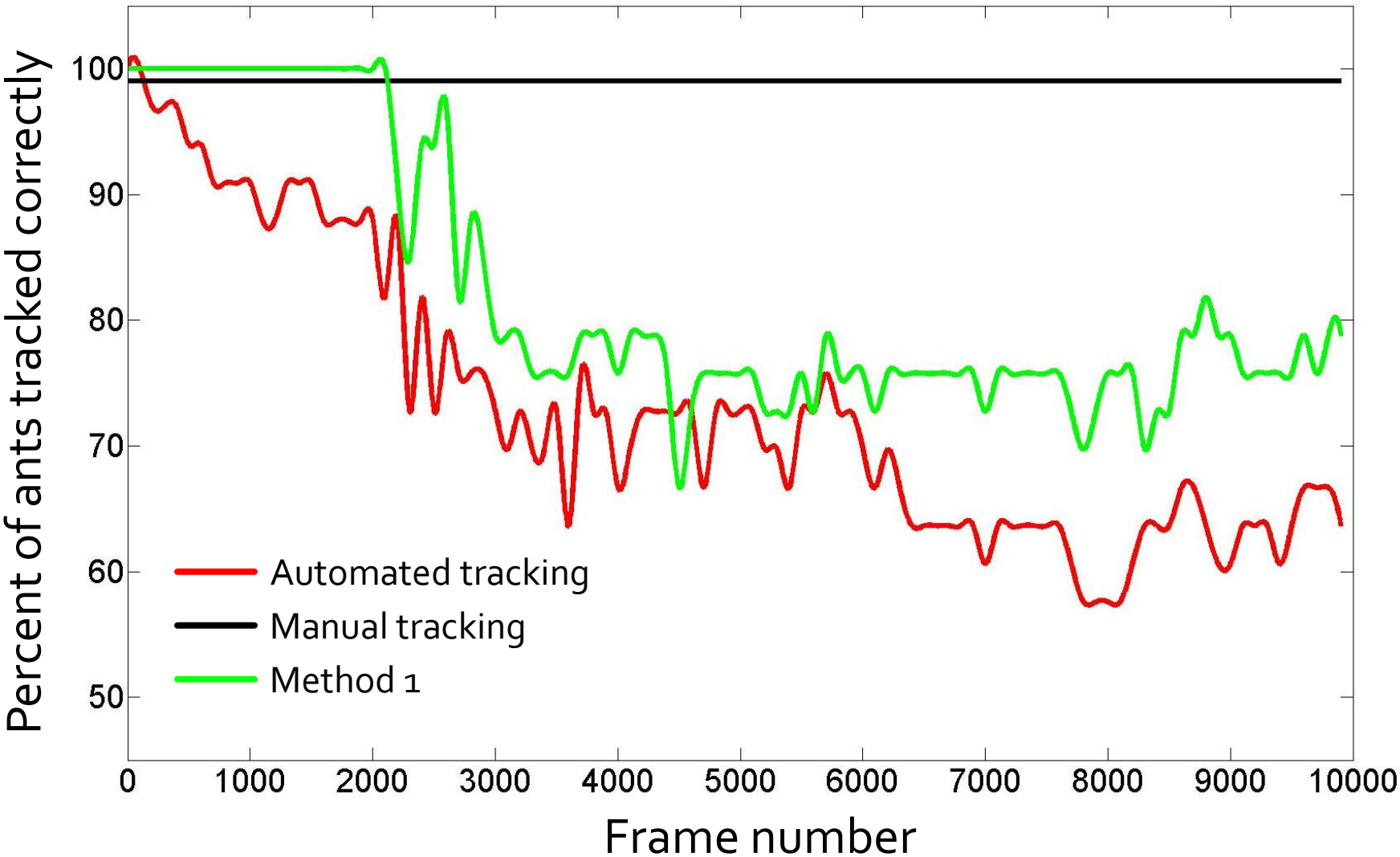


1. Automatic tracking
2. Automatic error detection
3. **Manual error correction**

Semi-automated tracking—method 1

1. **Automatic tracking**
2. Automatic error detection
3. Manual error correction

Method 1


Percent of ants tracked correctly
100
90
80
70
60
50
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Frame number
Automated tracking
Manual tracking
Method 1

The problem: ID switches

Before/during occlusion

Manual error correction

After occlusion

Self correction—method 2

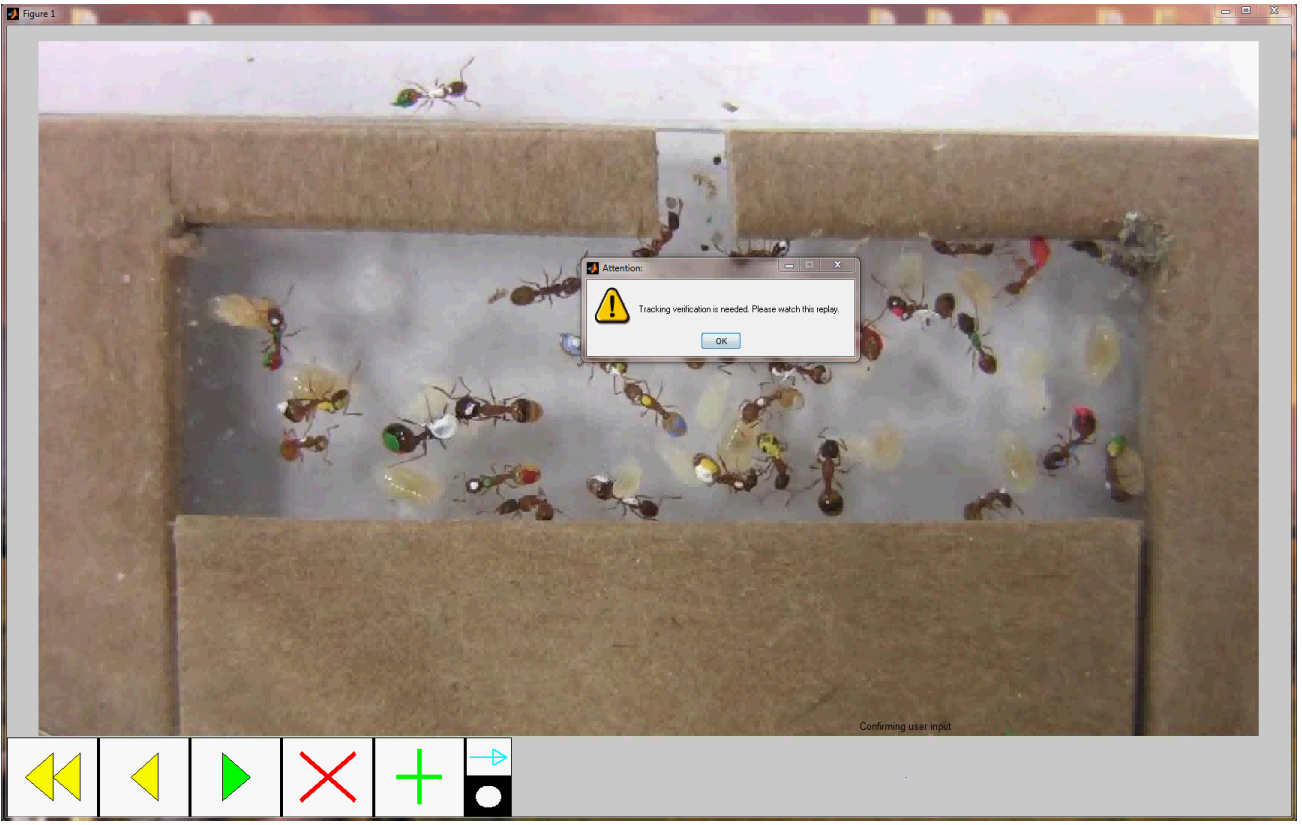
Speed and appearance $\stackrel{?}{=}$ Speed and appearance

Occlusion begins

Manual error correction

Playback for self correction

Semi-automated tracking—method 2

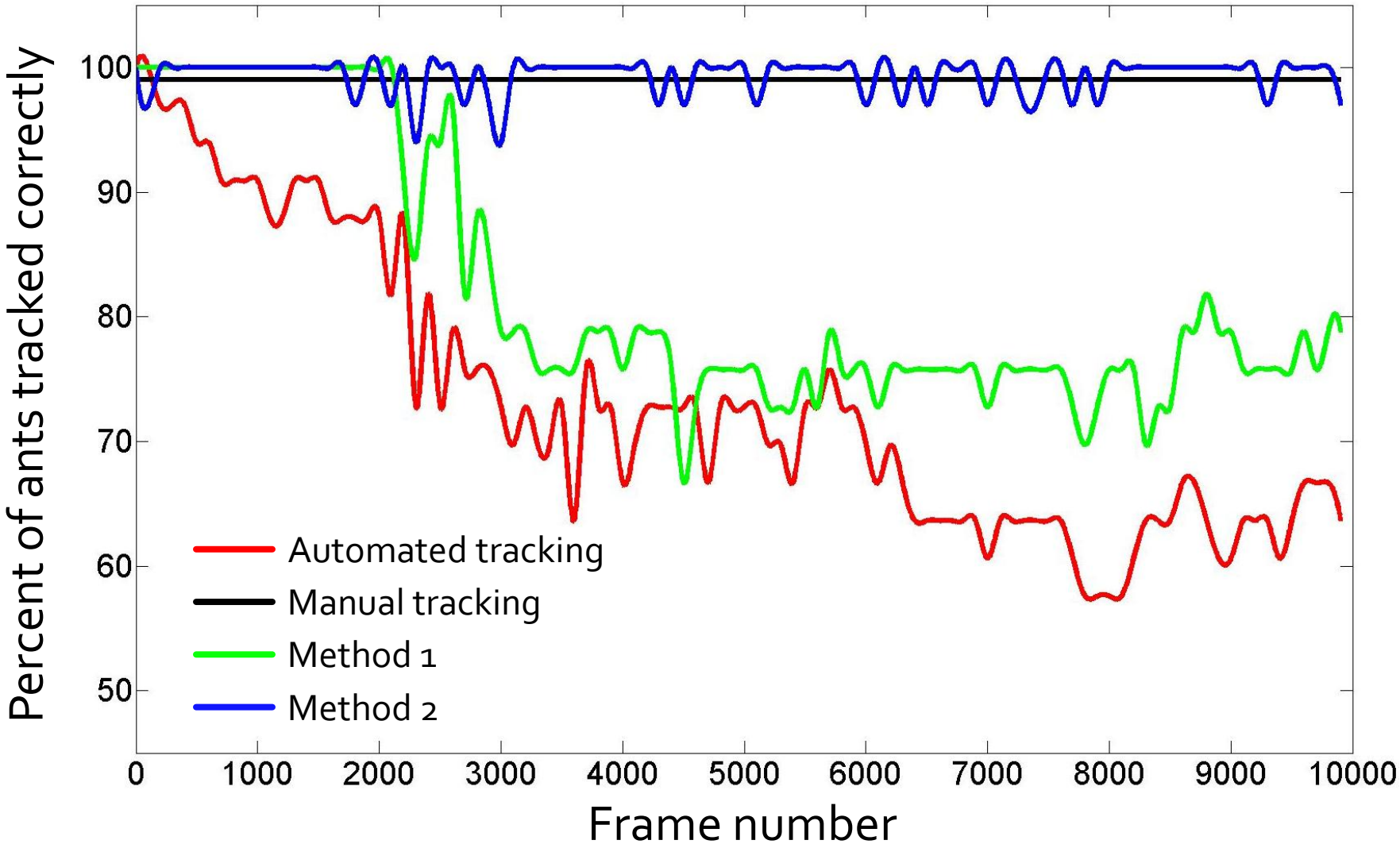


1. Automatic tracking
2. Automatic tracking error detection ***and occlusion*** handling
3. Manual tracking error correction and ***manual self correction***

User study

- 16 users in 2 groups
  - Method 1—w/o self correction
  - Method 2—w/ self correction
- Both groups contain:
  - Experienced and inexperienced users
  - CS and biology researchers
- Users track 10,000 frames of video containing 33 ants

Method 2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Automated tracking
Manual tracking
Method 1
Method 2

Results

Tracking method	Tracking Accuracy	Standard Deviation	User Interaction Time	Total Time
Fully manual	~99.0%	Small	Days	Days
Fully automated	73.1%	1.7%	0 mins	34 mins
Method 1	93.8%	5.2%	43 mins	112 mins
Method 2*	**98.5%**	**1.1%**	**99 mins**	**164 mins**

Questions?

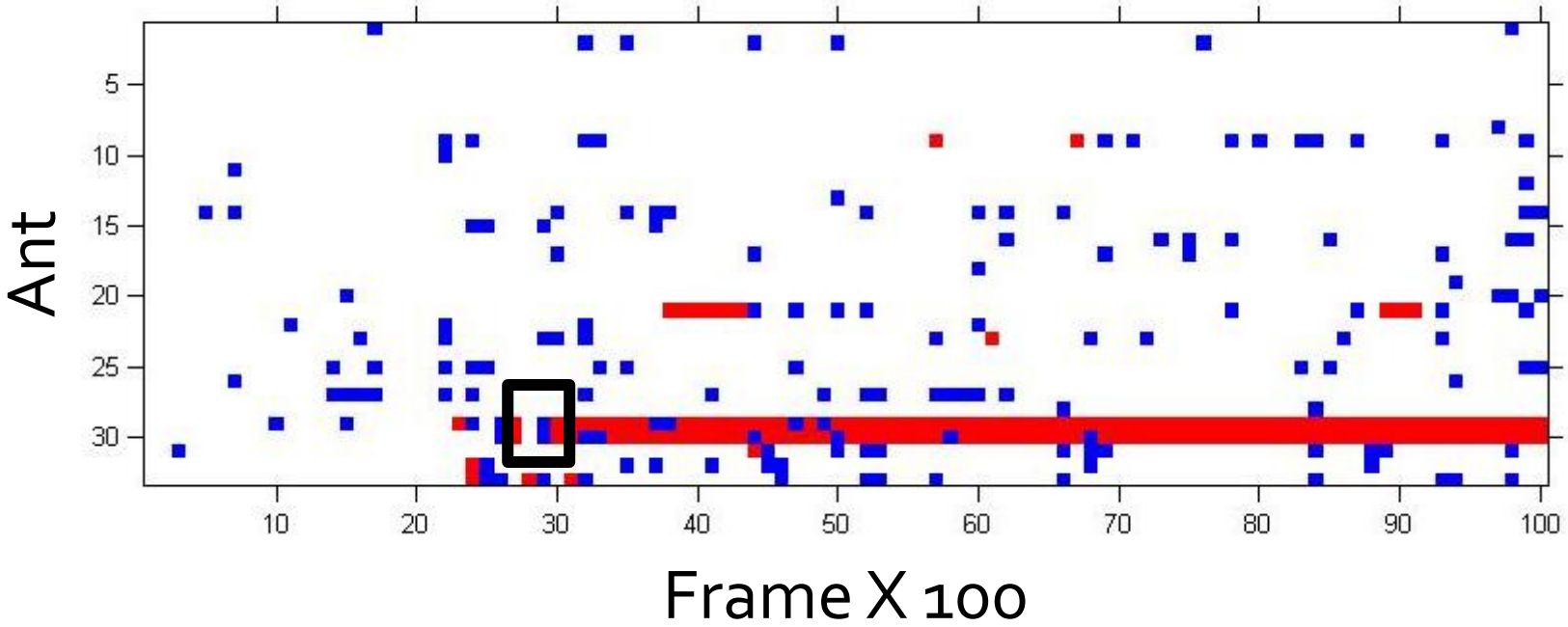
Frame 22 out of 10000 (Manual corrections--Select ant or action)

Results

User	% Correct	% Frames examined	Total interaction time (min)
CS	**99.3**	**1.32**	**45**
CS	99.2	1.88	144
CS	98.5	2.1	83
BIO	**99.3**	**1.9**	**130**
BIO	97.9	.8	124
BIO	96.5	1.3	71

New problem: incorrect user corrections

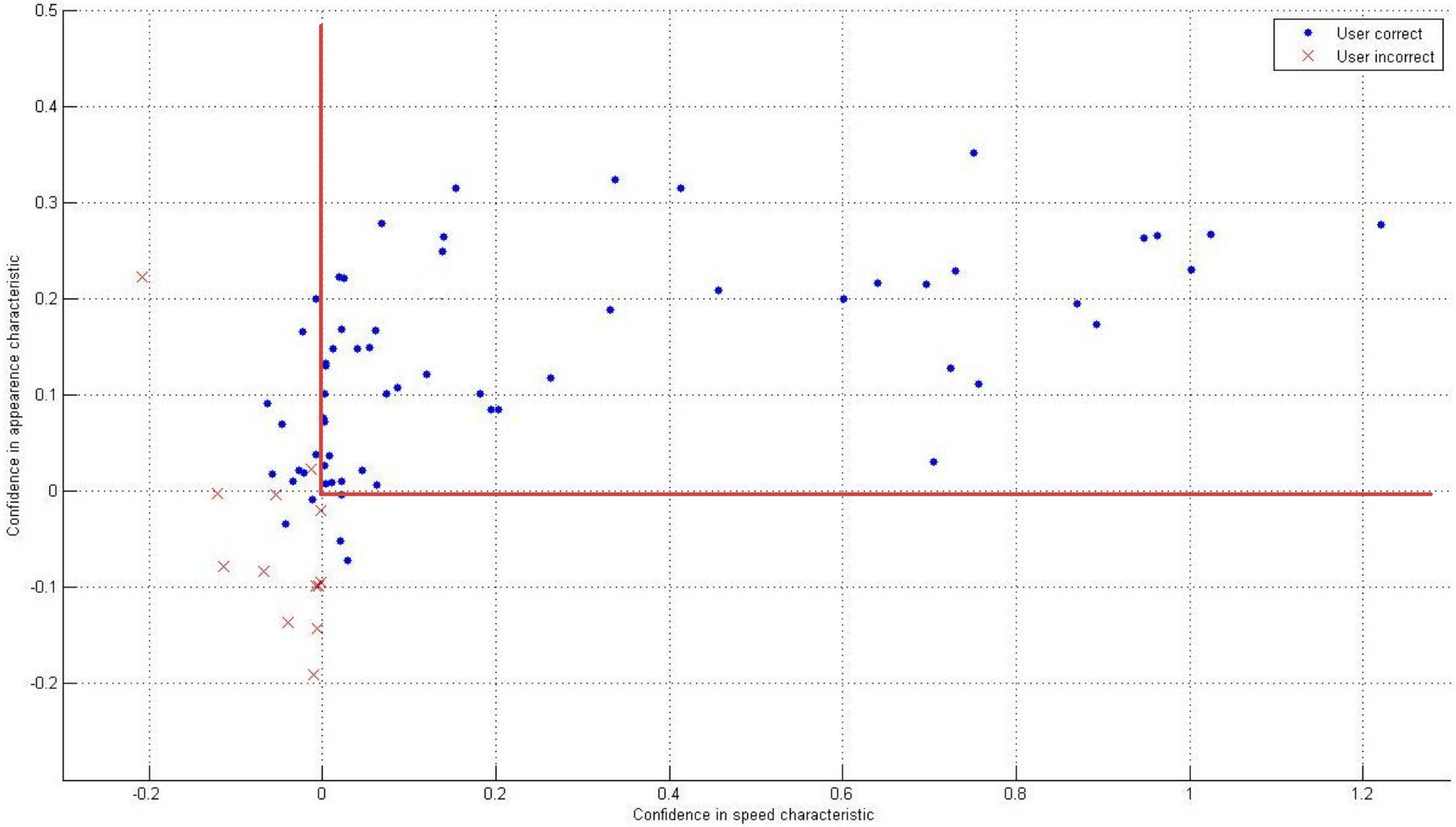
Error and corrections



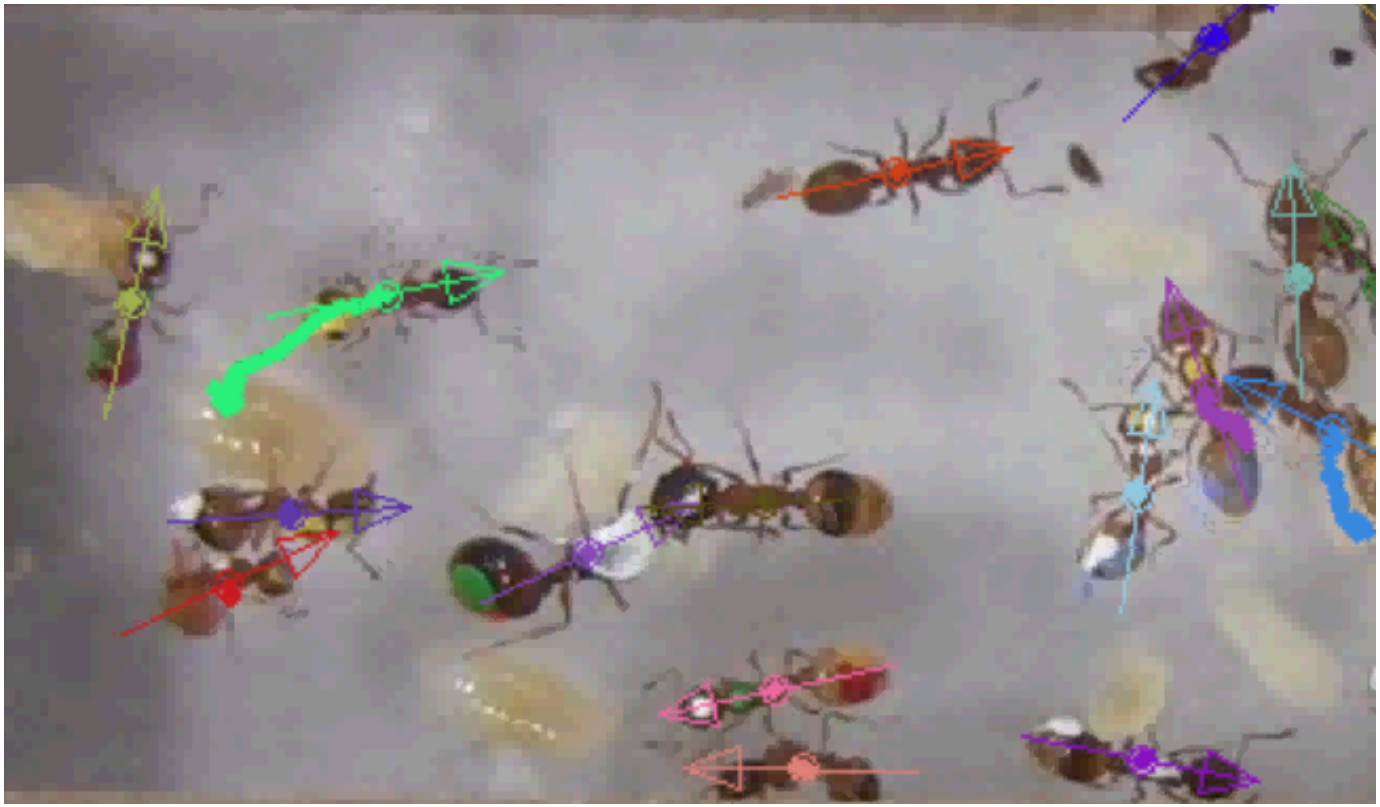
= user correction

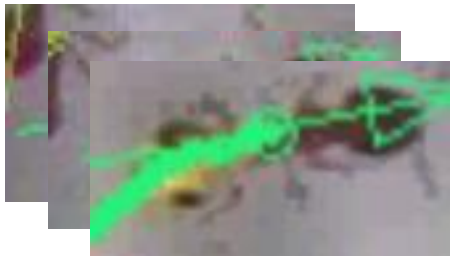
= tracking error

How well does it work?



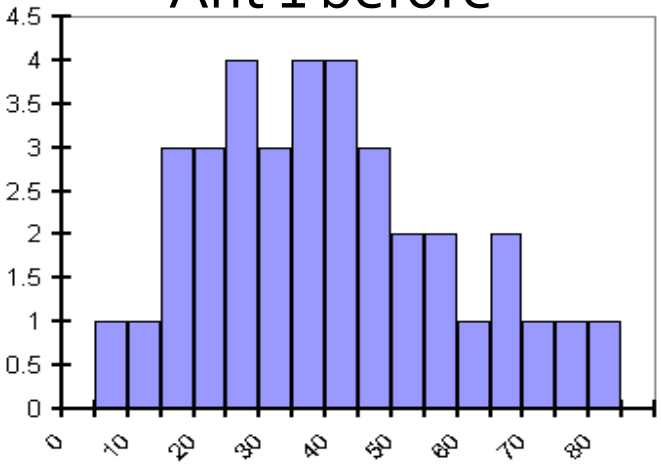
Ant appearance



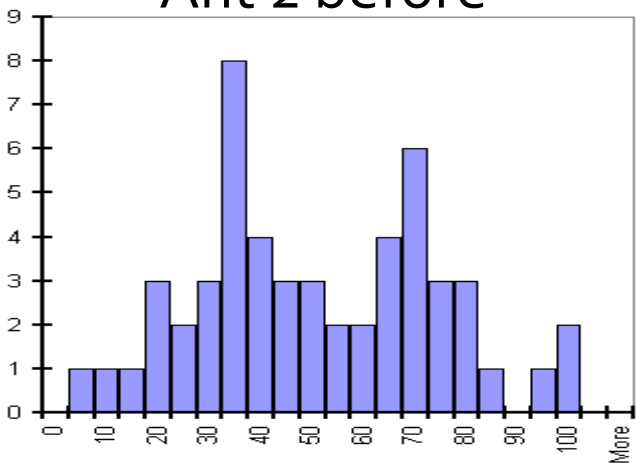


Ant appearance

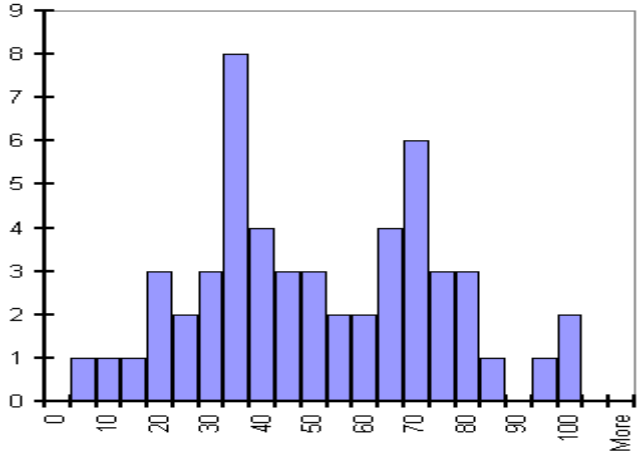
Ant 1 before



Ant 2 before



Ant 1 after



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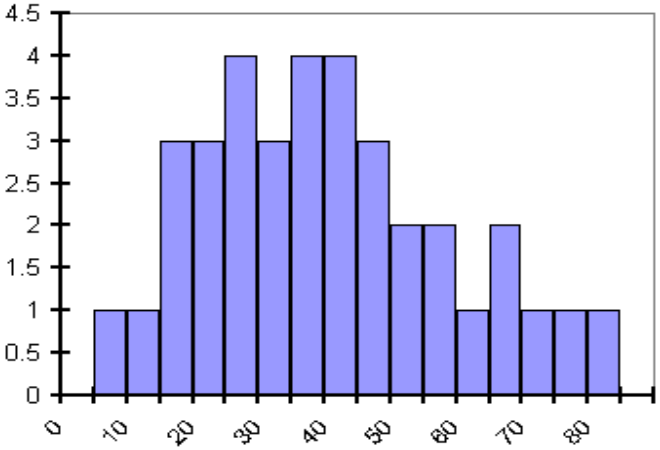
Ant 1 after



Semi-automated tracking—method 1

1. **Manual initialization**
2. Automatic tracking
3. Automatic error detection
4. Manual error correction