

# Augmented Reality Guided Equestrian Event Training

A prototype demonstrating how existing technology can be utilized to promote safety and efficiency in horseback riding.

Cross Country



Show Jumping



Racing

**What's the hardest  
thing about horse  
riding?**

The ground.



# Why is this important?

- Equestrian sports are dangerous
- Rider's head is usually 13 ft from ground
- Traveling at speeds up to 40 mph
- 100 deaths per year



# Why is this important?

- Faster, more efficient training can reduce occurrence of injury and death
- Aids both horse and rider

# Beginner Difficulties

- Balance
- Incorrect form
- Reading the horse's movements
- Understanding the horse's vitals

# Balance

- Jumping is a process that can be broken down into five phases
- Each phase requires a specific form
- Balance is integral to ensure safety

# Maintaining Center of Balance

Rider must be balanced over horse's center of gravity





# Maintaining Center of Balance



## Approach

During this phase, the rider needs to be sitting up, looking ahead and channeling the horse forward between their hand and their legs to maintain a straight line. The rider must approach the center of the fence, with the horse maintaining the impulsion and balance that is required.



# Maintaining Center of Balance



## Take-off

The rider needs to keep their lower leg securely wrapped around, to maintain the horse's energy and forward momentum. The rider's hands need to follow the movement of the horse's head and neck and still maintain a contact through the rein to the bit. Also, the rider should look straight ahead.



# Maintaining Center of Balance



## Suspension

At this point the horse will bascule in the air, and the rider must fold into the jumping position. To do this rider's upper body is lowered, the seat is slipped to the back of the saddle, and the hand position maintains a light contact through the rein. The rider's lower leg needs to stay securely wrapped around the horse to help maintain balance.





# Maintaining Center of Balance



## Landing

The rider brings their upper body back up into an upright position, their hands still in contact through the rein to the bit in the horse's mouth, without interfering with the horse's balance. The rider's lower leg should remain in position, still on the girth area of the horse, with the rider looking ahead to the next fence.





# Guidelines (constraints)

- Rider's hands have to be free, eyes must look up
  - wearable is better
- Shows require formal dress
  - wearable can only be used for training
- Design must make sport safer
- Rider needs feedback on their riding

# Guidelines (constraints)

- Tracking progress over several lessons is important for determining training methods
  - Trainer can save and analyze data collected from lessons to choose future exercises
- Devices must not cause discomfort or obstruct the horse
- Should assist communication between rider and trainer

# Solution for Rider

## **Guideline Solution:**

Wearable computing, such as eyeglasses, allow the rider to receive feedback through a hands-free format



# Solution for Rider

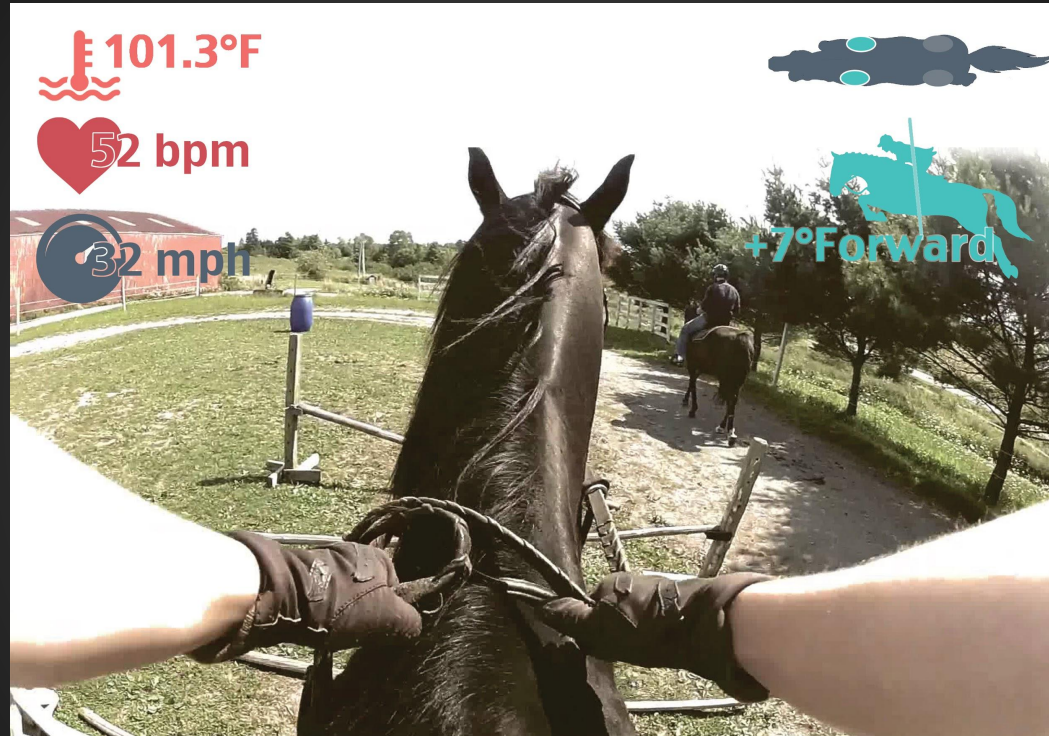
## Guideline Solution:

Although shows require formal dress, training can be enhanced and made safer with wearable computing





# Rider's View



**Guideline Solution:** HUD seen by rider during training. Notice the icons are towards the top, to discourage rider from looking down.

# Rider's View

Horse's body temperature

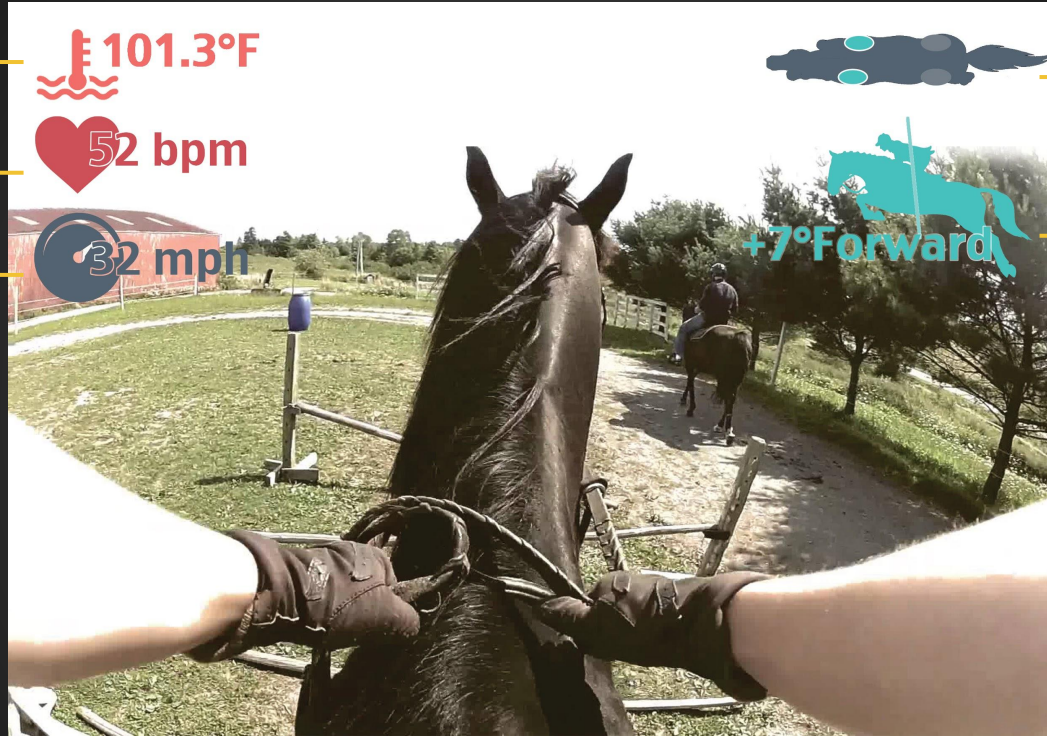
101.3°F

Heart rate of horse

52 bpm

Current speed

32 mph



Indicator of horse's leg movement

Feedback on rider's position in saddle

**Guideline Solution:** Rider receives feedback about the horse's vitals and their performance.

# Solution for Trainer

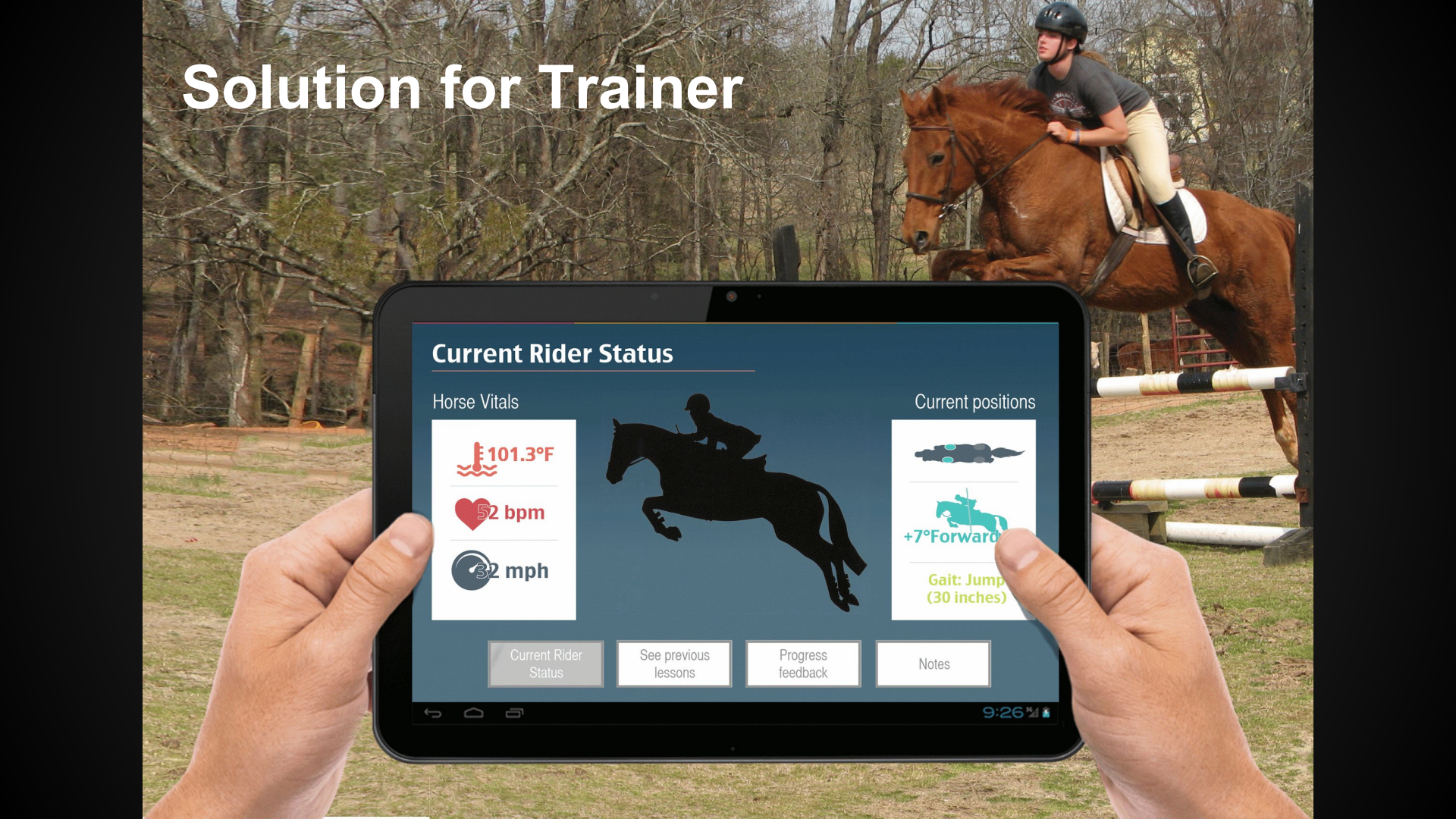
## Guideline

**Solution:** Data gathered on rider's performance can also be accessed by trainer through tablet device






# Solution for Trainer



**Current Rider Status**

Horse Vitals

- 101.3°F
- 52 bpm
- 32 mph



Current positions

- +7° Forward
- Gait: Jump (30 inches)

Current Rider Status    See previous lessons    Progress feedback    Notes

9:26



# Solution for Trainer




**Current Rider Status**

 **Rider is pulling too hard on the reins** | 21.35 Newton

Horse Vitals


 **100.8°F**

 **47bpm**

 **32 mph**



Current positions



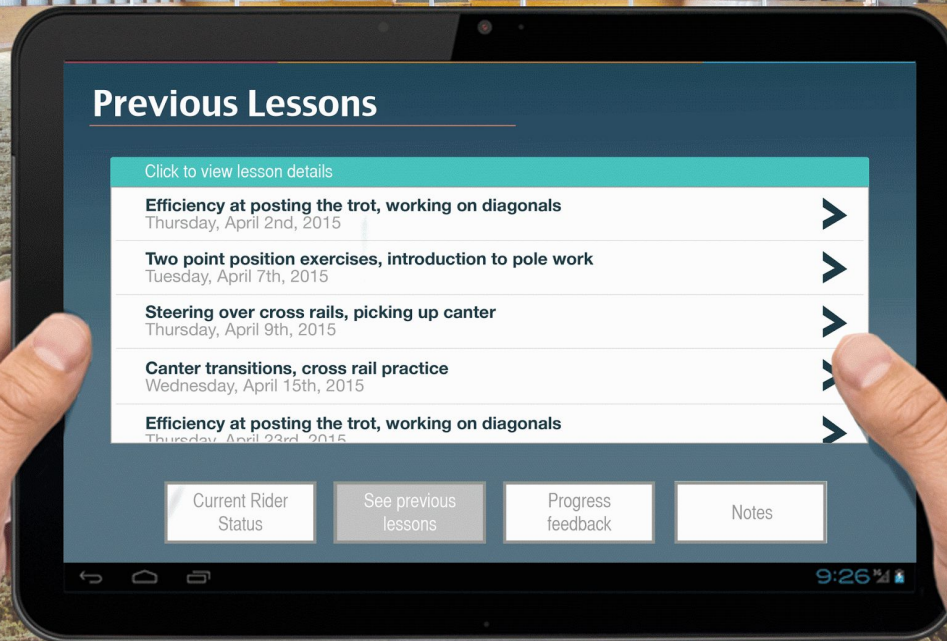
 **-15° Back**

**Gait: Canter (left)**

Current Rider Status | See previous lessons | Progress feedback | Notes

9:26

# Solution for Trainer





# Solution for Trainer

**Progress Feedback**

**Ashley**

Age: 21  
Lessons: 34  
Highest Jump: 30 inches

Rein usage  
Right: 15 newton  
Left: 11 newton

Trot - Level Intermediate  
Canter - Level Intermediate  
Jump - Level Beginner  
Leads - Level Proficient

Current Rider Status    See previous lessons    Progress feedback    Notes

9:26

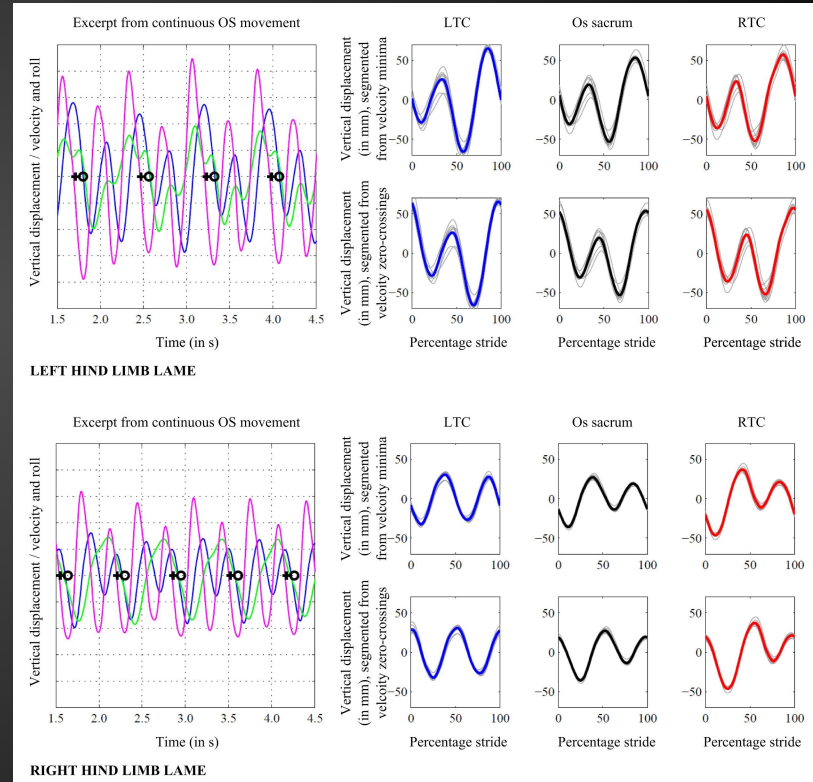
# How data could be collected

- Data for horse gait analysis can be gathered through motion tracking technology



# How data could be collected

- Pelvis mounted sensors have been used to detect equine lameness
- Collects data on vertical movement and axial rotation





# How data could be collected

- Existing technology utilizing sensor mats can measure the dynamic pressure distribution between the saddle and the horse



# Sensors



Several sensors are required to gather the data necessary for this system

# Sensors

Torso mounted sensors

Bit equipped with force measurement capabilities

Leg markers for motion capture

Sensor tracks position of head

Wearable strap determines rider's center of balance

Pad for gathering data on pressure distribution

Vitals monitor (heart rate, temperature)



# Additional benefits

- Cross compatibility between trainers
- Comparative analysis possible between horses
- Gamification can be used to track progress and incentives for riders

# Sources

<http://www.riders4helmets.com/equestrians/>

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