



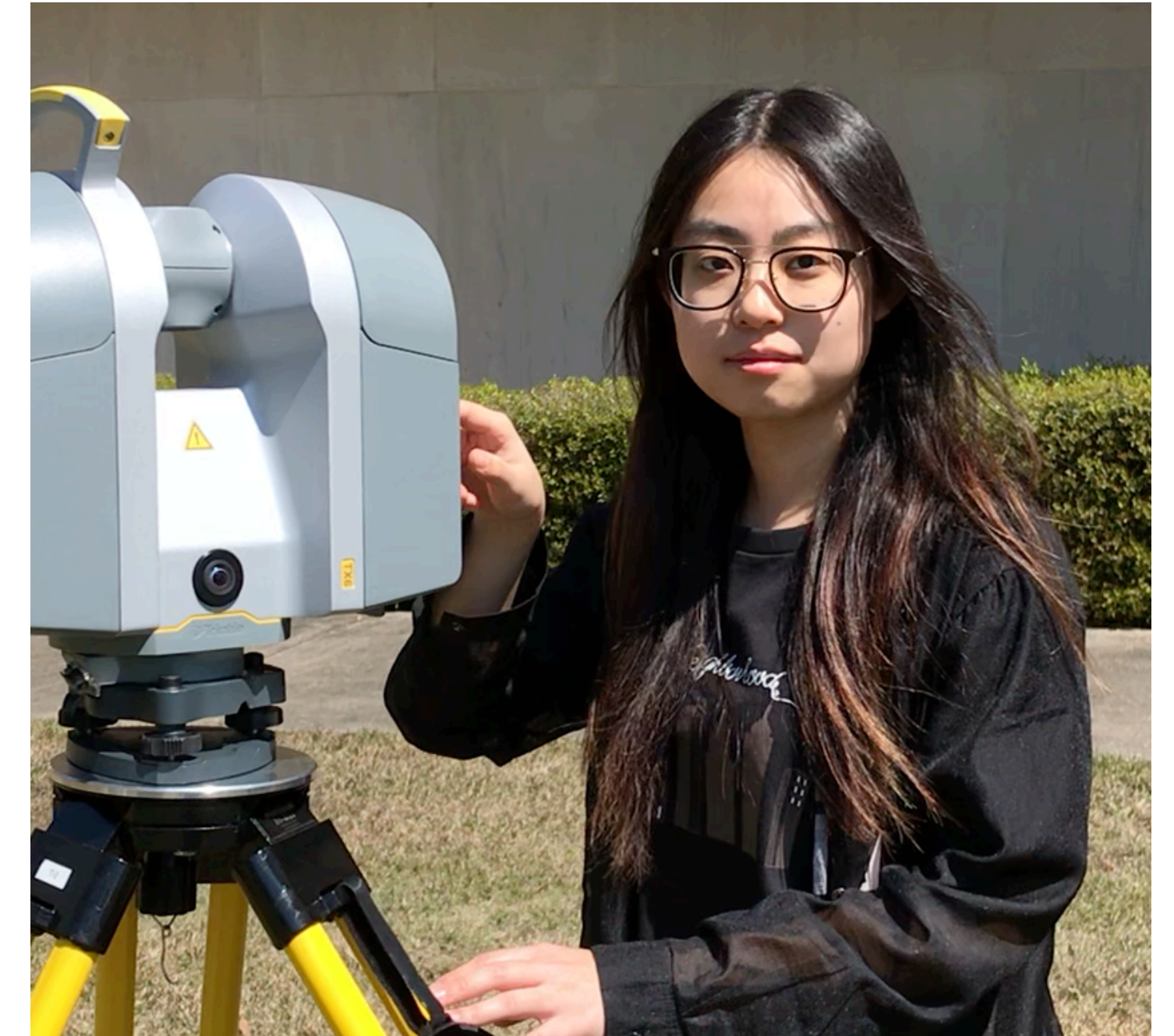
# AUGMENTED AND VIRTUAL REALITY UTILIZATION TO SUPPORT GEOSPATIAL LEARNING: MAKING CONNECTIONS USING LandXML

Yitong Wu & Bill Hazelton, Troy University Geospatial Informatics

# ABOUT US

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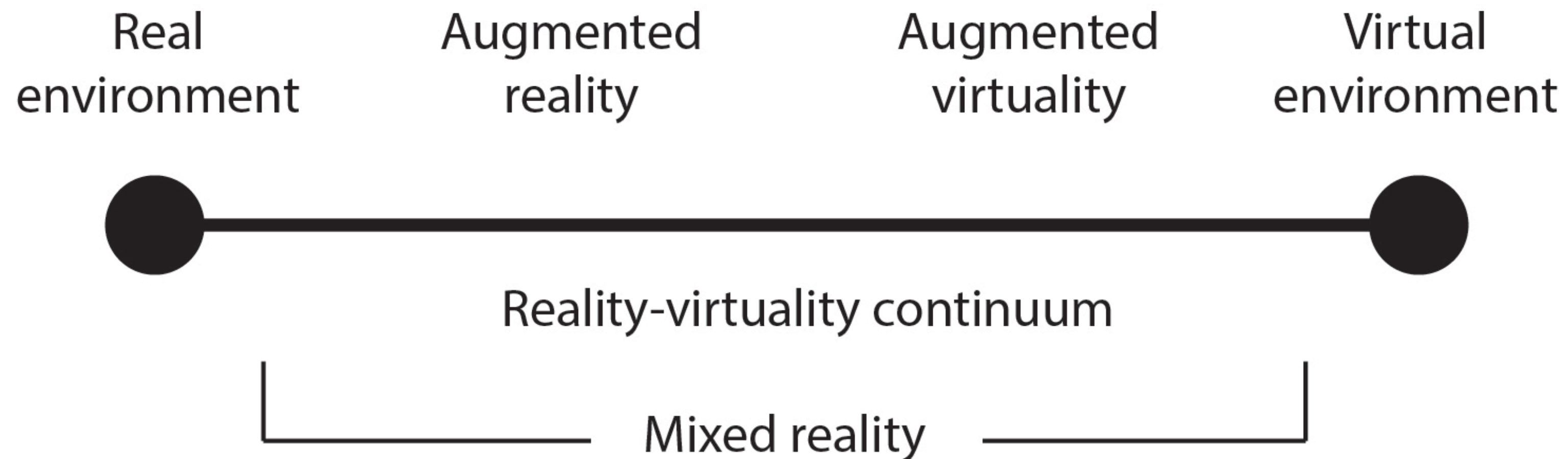
- Yitong Wu
  - Chancellor's Fellow at Troy University
  - Student at Troy University
  - This is part of her fellowship research
- Bill Hazelton
  - Surveyor for 40+ years and licensed 35 years
  - Educator and researcher for over 30 years
  - Worked as a surveyor on 3 continents
  - Professor at Troy University



# REALITY AND VIRTUALITY

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- On a continuum from reality to virtuality, augmented reality (AR) is primarily reality with some virtuality added to augment the user's experience of that reality
- The emphasis is on the real environment, so AR needs a means to augment, commonly a phone or tablet that can pass through a video of reality, connect the virtual part to that reality and merge them in the image shown



# APPLICATIONS

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# LandXML

- LandXML is an extension of XML to include land-related tags, with associated attributes
- The style will be familiar if you know HTML:

– **<Parcels>**

```
<Parcel name="7330WHITSUNDAY SHIRE" pclRef="7330WHITSUNDAY SHIRE"/>
```

```
<Parcel name="511CANNONVALE" pclRef="511CANNONVALE"/>
```

```
<Parcel name="1595DRYANDER" pclRef="1595DRYANDER"/>
```

```
<Parcel name="138HERBERT" pclRef="138HERBERT"/>
```

**</Parcels>**

```
<Title titleType="title" name="20995221"/>
```

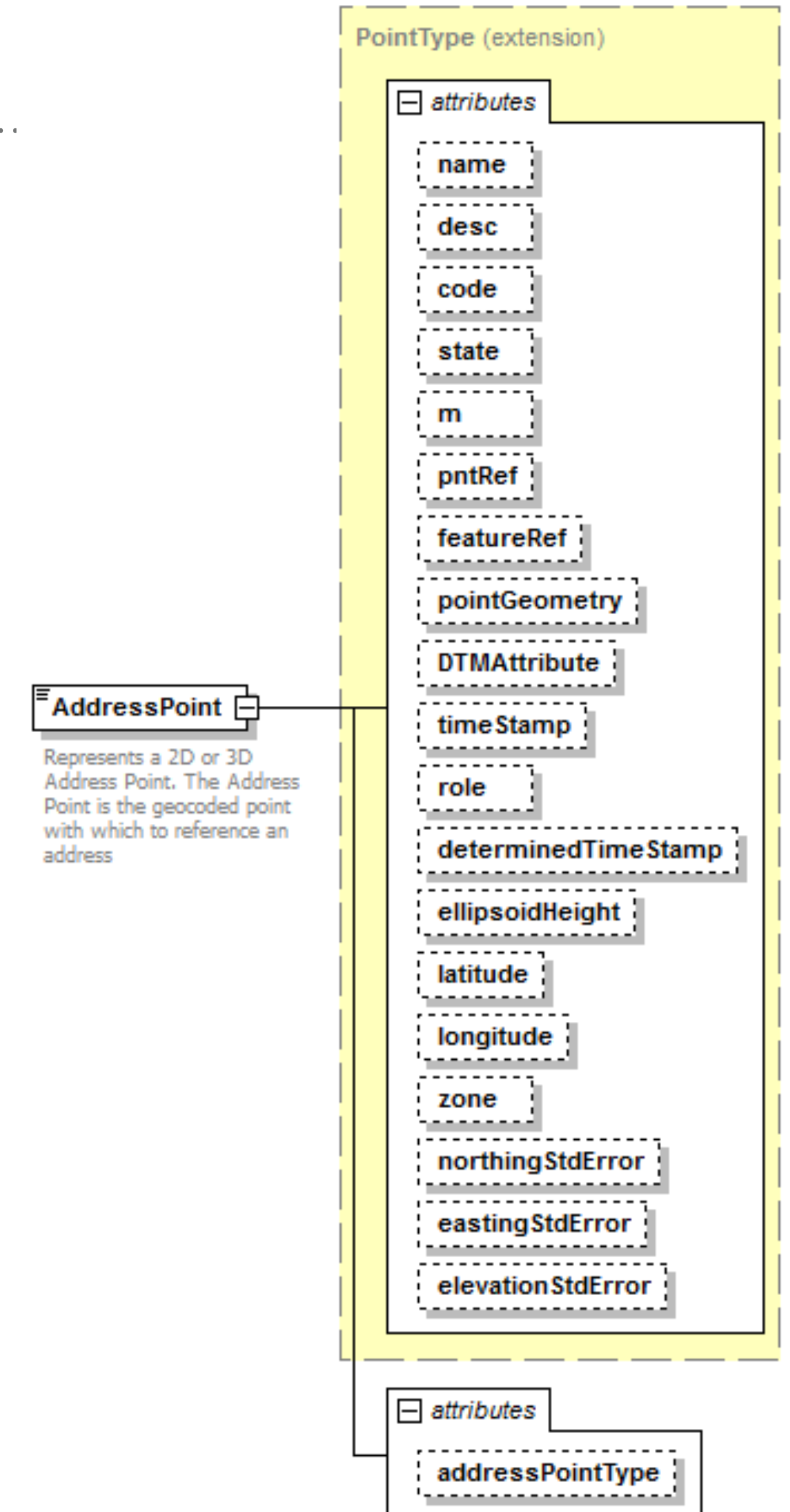
```
<Exclusions exclusionType="area" area="0.00"/>
```

– **<Feature>**

```
<Property value="Y" label="areaSurveyedFlag"/>
```

```
<Property value="Freehold" label="dcdbTenureRecord"/>
```

**</Feature>**



# LandXML

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- Unlike CAD data storage, where layers are used for differentiation, LandXML uses attributes attached tags to differentiate spatial objects
- This allows a more nuanced search and representation in an AR view
- This, in turn, allows an attribute-rich AR environment to be in field devices
- As attributes are becoming increasingly important in field data collection, an attribute-rich AR environment to help with attribute collection
- Tablets as data collectors can help drive this trend
- LandXML allows transfer of attribute-rich spatial information to CAD and GIS

# AUGMENTED REALITY

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- Adobe's five sensory design principles:
  - Intuitive experiences are multisensory
  - 3-D will be normal and core technology
  - Designs become physical by nature
  - Design for the uncontrollable
  - Unlock the power of spatial collaboration
- Adobe is investing heavily in UX (user experience) technology
- We are still in the early stages of AR, but it is a rapidly growing trend

# WHY LandXML?

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- CAD has limited attribute capabilities, often using an external data file
- GIS has far richer attribute capabilities
- Attributes are becoming more important, as spatial data becomes easier to collect
- We need a means to transfer information that carries both spatial and attribute data between GIS database and field data collection devices
- Data collectors can also be used as set-out devices, with suitable positioning
- As AR usually operates over a limited range, being able to extract data from a GIS in tiles for easy transfer and download will be important for operations



# WHY LandXML?

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- LandXML is user extensible
- Unlike KML, LandXML has strong attribute handling capabilities
- LandXML concentrates spatial and attribute data in a single XML file
- LandXML is at an early stage in its development, compared to KML
- LandXML is increasingly being used as a means of transferring cadastral information

# EDUCATIONAL ASPECTS

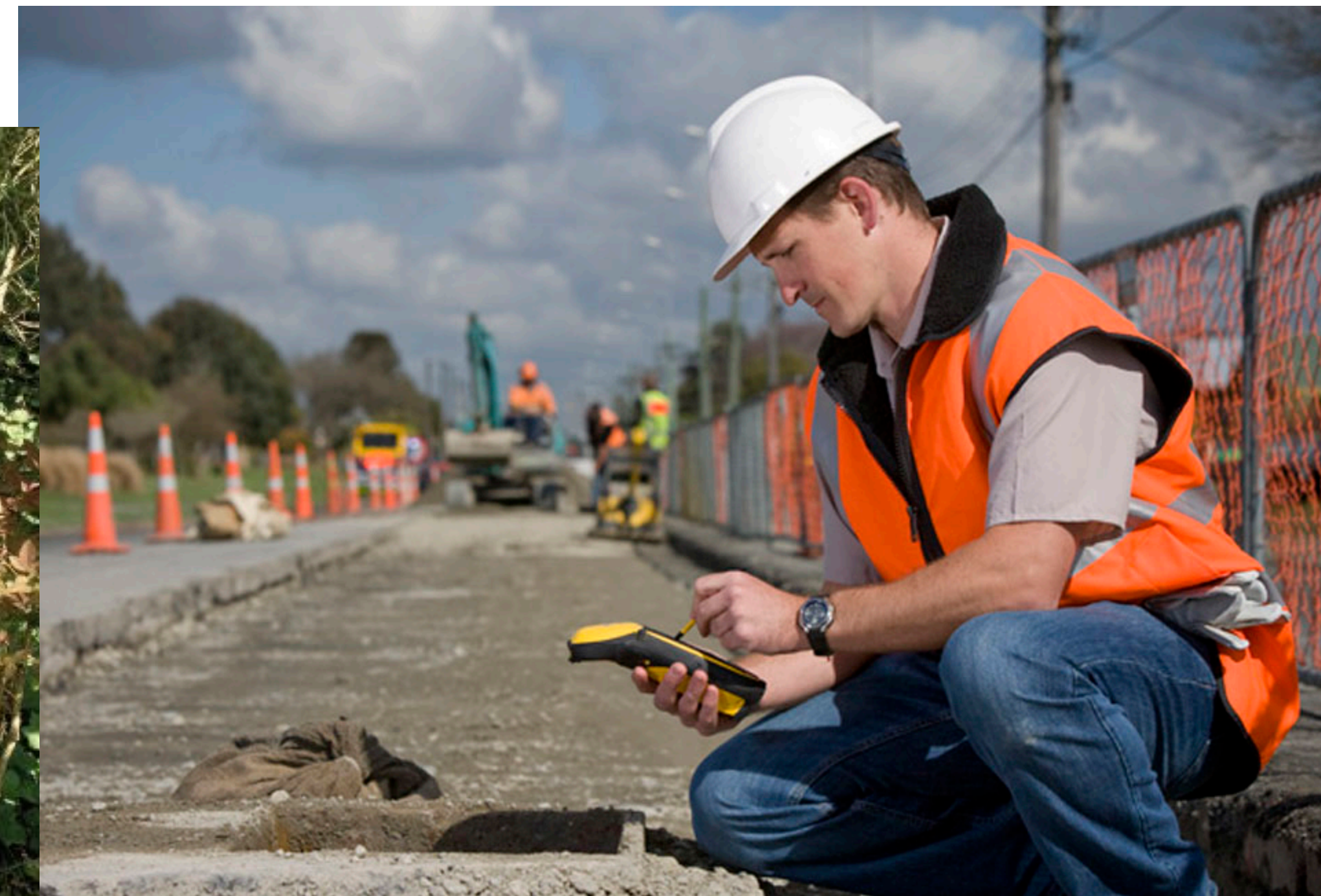
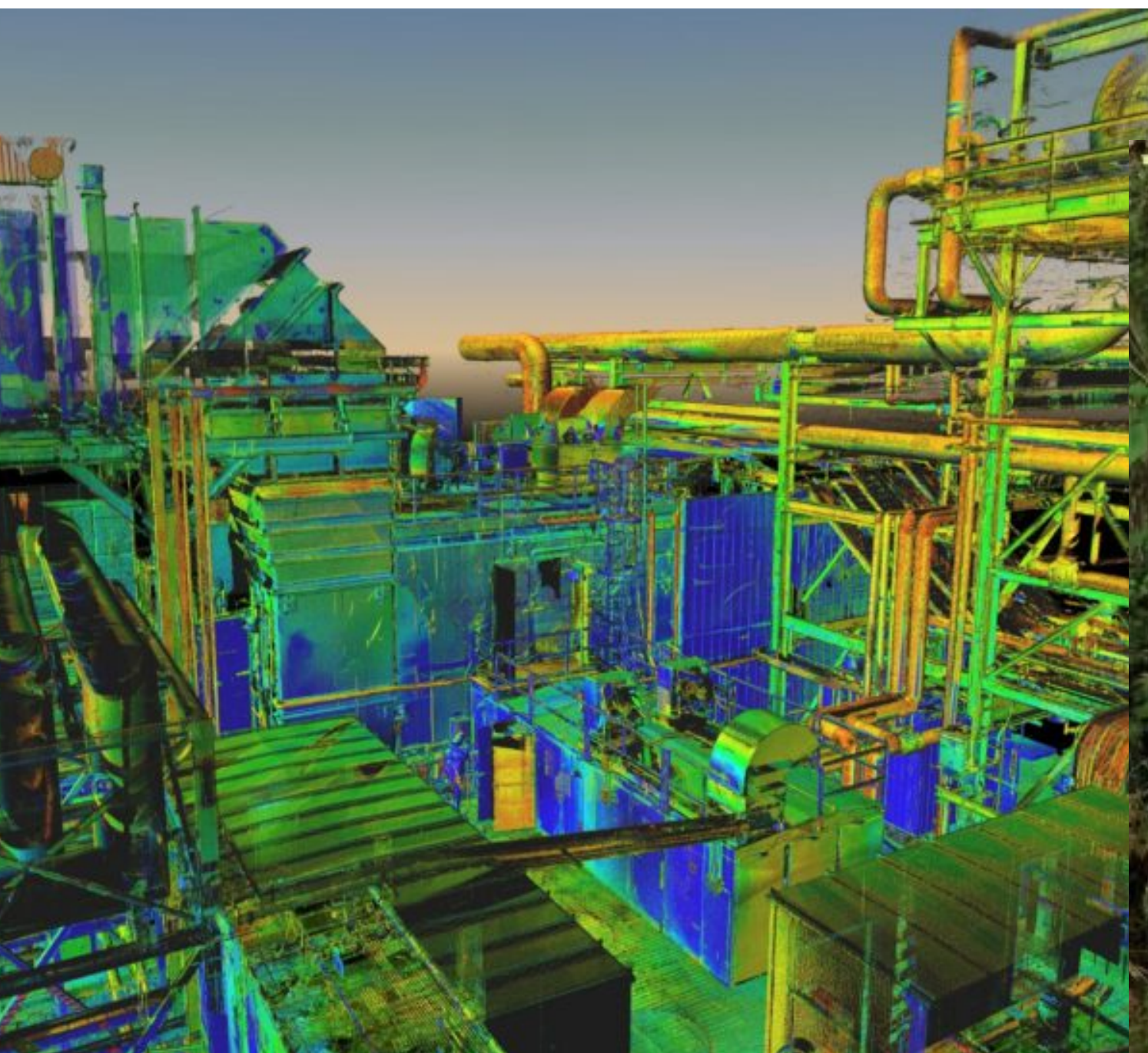
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- AR can help develop spatial reasoning capabilities by making implicit characteristics in the real world explicit
- Visualizing what they are learning is a critical part of students' learning
- Visualization can be a two-way street, if students can undertake visualization exercises as part of their learning process and assessment
- AR is being used for training, especially for maintenance people in complex environments
- LandXML as a means of transferring land information is going to become more important as our students move through their careers

# TWO DIFFERENT APPROACHES

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- In geomatics data collection, two different approaches are developing and diverging
  - One approach takes advantage of the productivity increases of the last 20 years in collecting 3-D locations
  - The other approach focuses on collecting a large amount of attribute data at each data point



**QUESTIONS?**

**THANK YOU!**