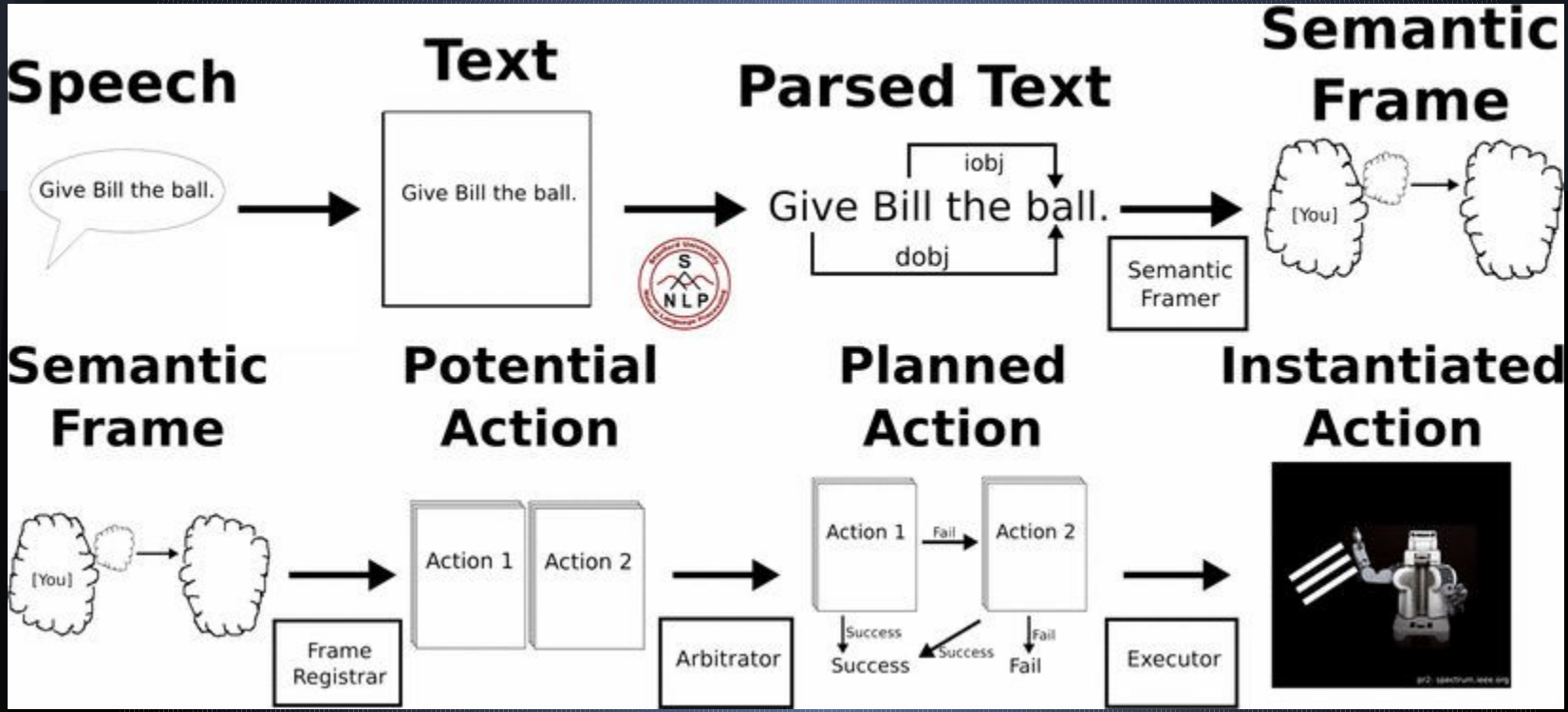
Speech based Control of Articulated Robots

Group - 24



Source - RoboFrameNet Paper

- Speech to Text
- Text to Parse tree
- FrameNet
- Action Parser
- Robot Simulation and Navigation

Speech to Text

['{"result":[{"alternative":[{"transcript":"pick up the spoon from the table","c
onfidence":0.75902778}],"final":true}],"result_index":0}']

- Implementation of Google Web Speech API
- .wav to .flac

Parse tree

```
(ROOT
  (S
    (VP (VB Pick)
      (VP
        (ADVP (RB up)
          (NP (DT the) (NN spoon))
          (PP (IN from)
            (NP (DT the) (NN table))))
```

- Implementation of Stanford NLP Parser

FrameNet

- Semantic frame encapsulates concept of scene being acted out
- Includes core and noncore frame elements

FrameNet

- All lexical units specifying the verb are recalled

```
>>> f.lexUnit
{'allopathy.n': <lu ID=4601 name=allopathy.n>, 'cardiology.n': <lu ID=4590 name=
cardiology.n>, 'chiropractic.n': <lu ID=4598 name=chiropractic.n>, 'dentistry.n'
: <lu ID=4591 name=dentistry.n>, 'dermatology.n': <lu ID=4592 name=dermatology.n
>, 'endocrinology.n': <lu ID=4593 name=endocrinology.n>, 'epidemiology.n': <lu I
D=4594 name=epidemiology.n>, 'gastroenterology.n': <lu ID=4595 name=gastroentero
logy.n>, 'gynaecology.n': <lu ID=4596 name=gynaecology.n>, 'haematology.n': <lu
ID=4597 name=haematology.n>, 'histology.n': <lu ID=4599 name=histology.n>, 'home
opathy.n': <lu ID=4600 name=homeopathy.n>, 'immunology.n': <lu ID=4605 name=immu
nology.n>, 'medicine.n': <lu ID=4622 name=medicine.n>, 'midwifery.n': <lu ID=460
2 name=midwifery.n>, 'neonatology.n': <lu ID=4610 name=neonatology.n>, 'nephrolo
gy.n': <lu ID=4611 name=nephrology.n>, 'neurology.n': <lu ID=4612 name=neurology
.n>, 'obstetrics.n': <lu ID=4613 name=obstetrics.n>, 'oncology.n': <lu ID=4614.n
```

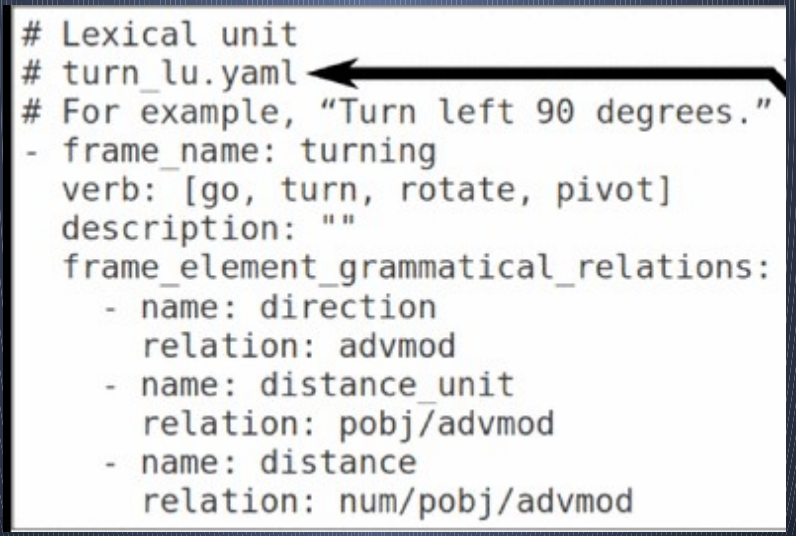
FrameNet

- Attempt to fill each lexical unit using dependencies
- Successfully filled lexical unit are passed to Action Parser

```
(ROOT
  (S
    (VP (VB Pick)
      (VP
        (ADVP (RB up)
          (NP (DT the) (NN spoon))
          (PP (IN from)
            (NP (DT the) (NN table))))
```

Action Parser

- Map the lexical unit to the predefined motion and its categories



Source - RoboFrameNet Paper

Robot Navigation

- Simulation on PR2 in ROS
- Implementation of *pr2_navigation* node, SLAM
- *pr_controllers* - node for Actuators
- *pr_gripper* - node for pick and place

References

- Brian J Thomas and Odest Chadwicke Jenkins. RoboFrameNet: Verb-centric semantics for actions in robot middleware. ICRA2012
- http://wiki.ros.org/pr2_controllers
- http://wiki.ros.org/pr2_navigation
- https://framenet.icsi.berkeley.edu/fndrupal/
- Google Voice Recognition
- http://nlp.stanford.edu/software/lex-parser.shtml