**Non-Verbal Behavior and Rapport**

1. **Rapport theory and measurement (Keep small – not focus)**
   1. Base Definitions
      1. What is rapport?
      2. How we measure it – brief about the splicing and outsourcing
   2. Virtual agent is a friend, not a tutor
      1. Rapport levels more between friends than between strangers
      2. Learning outcomes better when students “like” instructors than when they don't know instructors
2. **Appropriate NVB increases rapport levels**

Common Questions in all of the following NVBs

* + 1. When? – context or time? Trigger behaviors – state they are in, performance, etc.
    2. How much / long?
  1. Gaze
     1. Types of gaze
        1. Mutual
        2. Referential
        3. Joint attention
        4. Gaze aversion
        5. Gaze stare (new)
     2. Gaze tradeoffs – be clear about this
  2. Nodding
     1. Represents responsiveness, readiness
     2. Sign of understanding, reassurance
  3. Smile
     1. What does smiling signify?
     2. Types of smiles
     3. Wrong timing may decrease rapport levels
  4. Eyebrows
     1. Perhaps a sign of concentration – no trend of this NVB itself was found – perhaps see in conjunction with other NVBs?
  5. Lookup Ekman facial scheme / action units – nose crinkling etc
  6. Posture?

1. **Automatic Detection of NVB**
   1. OpenCV / OpenFace models
2. **Memory Model to inform NVB (check with Will to prevent overlap)**
   1. Virtual agent as a friend, not a tutor
      1. What to remember?
      2. How to use the memory and NVB?
         1. Agent can jump into “friend” mode from start of the session in the subsequent sessions
3. **Relationship between Verbal Behaviors and Non Verbal Behaviors**
   1. Small talk is good for rapport levels
   2. Every VB should have a category of NVB associated with it
      1. Tone, Pitch, Amplitude & theme of utterance (positive with smile / reassurance, negative with perhaps eyebrows a bot frowned, etc.)
4. **Generation of NVB (goal of the proj not needed in the lit review)**
   1. Make a library of NVB of the agent along with generally associated rapport levels
   2. Steps
      1. Detect NVB of student / determine which category of NVB will be used to response
      2. Detect current rapport levels using NVB of student
      3. Choose which NVB agent should use to not have a negative / have a positive impact on rapport

Unity3D and NVBs?

**Potential Research Questions**

1. Should we aim to make the virtual agent a friend than a tutor? XXX
2. **Which non-verbal behaviors have most positive impact on rapport levels and when and to what extent should the virtual agent use them?**
3. **How to pair up non-verbal behaviors with verbal behaviors in order to get tuples of reactions that increase rapport level**
4. How to use memory models to increase rapport levels in the long term? [scope down to research q to ask n answer rn][work on this]

< Still have to work on research questions >

* Understanding problem space
* Understanding gaps
* Research Qs

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