1. **Research Title:** Sensor Exploitation via Intelligent, Context-based Computing
2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:** Electrical Engineering, Computer Engineering, Computer Science, and Math (BS, MS or Ph.D. level)
4. **Objectives:** Research and develop non-traditional computing approaches to improve performance/accuracy of various sensor exploitation-related problems (such as dismount tracking and UAV sense-and-avoid). This will require becoming familiar with related topics which may include (depending on the research focus) qualia, common search techniques, graph theory, contemporary computer architectures, neural networks, theory of mind, image processing and other related ATR techniques and technologies. The end result of the research would be to build a proof-of-concept, however, the end result can be scaled based on the education level of the researcher. The work should be done in collaboration with the AFRL Sensors Directorate. Publication in public forums such as conferences is encouraged, but may be dependent on the specific area of research.
5. **Description:** Qualia are qualitative and relative representations of "feelings" within the natural world. Current theory of mind suggests that qualia allow all levels of intelligence to abstract in some form, enabling truly dynamic interaction with the environment. Some research has been done to allow computers to leverage qualia to provide for more intelligent decision making, however, these efforts have fallen short in that they only mimic the qualities of a qualia-based system. The focus of this research effort would be to research techniques for manifesting qualia in a computer to enable intelligent, context-based decision making in order to improve over the current sensing paradigm that is heavily data dependent and fragile (i.e., works only in specific cases). Sensing scenarios of particular interest include dismount tracking – to track people that have exited a vehicle - and UAV sense and avoid – to give UAVs better self awareness for advanced operation.
6. **Research Classification/Restrictions:** This research can be accomplished with publicly available data, but FOUO and ITAR restrictions provide more relevant data opportunities.
7. **Interest in Summer USAFA Cadet (Avg Cost for USAF Cadet for 33 days was $4000):** Please indicate interest in sponsoring a USAF Cadet in Summer of 2008.
8. **Eligible Research Institutions:**
   Universities (DAGSI) – Yes (MS or Ph.D.)
   USAFA – Yes
   AFIT- Yes