Designing Artificial Awareness within the Regenerative Framework

The regenerative framework, as outlined by John Hardman (1), is the sustainable, mature, and sophisticated approach to solving global problems typically regarded as infeasible/unapproachable by conventional standards. The core of this framework is mutual empowerment, collaboration, and inspiration. There is an implied synergy between participants which when invoked, creates unanticipated solutions. The question of how the RF relates to AA will have to wait. The more central question of 'why AA now' will be asked first .. AI has progressed somewhat incrementally as our technology in the digital domain has advanced in leaps and bounds. There is no need to rehash that development. However, it provides a stark contrast to development in AI and AA. Efforts in AI typically deal with expert systems or dedicated functionality such as the artificial retina (2) program. While impressive these efforts surely are, they do not obviously contribute to areas such as general problem solving (3) or AA. In order to effectively address these areas, we propose a generalized (4) systems-reliability approach which incorporates the notion of synergistic-engineering so badly needed for this effort, to successfully address it, and hence we answer the question: why RF.

The notion of synergy as a systems concept is not new, but the idea of defining it precisely and attempting to incorporate it into modern control is (5). In that article, we propose synergy control as a new advanced sub-domain of modern control. Of course, by no means do we propose we can control synergy as we control a linear system, for example. However, we propose a unique and hopefully useful definition if synergy and suggest how that new discipline might be developed. Synergy may be controllable from an engineering standpoint. This opens the possibility: *synergy may be engineered*.

From the psychological and biological views, the human mind is complex and perhaps ineffable (6). From the functional perspective, mind is completely describable in words (7). The challenge becomes: can we take those words and implement them in digital systems? More importantly: should we? That consideration is beyond the scope of this article. The interested reader may find references here (8). To continue with the first question, we outline the components of mind using psychological functional terms which have some promise to be translated to digital terms. Before we launch into that, we have two concerns as developers of AA within the regenerative framework: the safety of human civilization and what may most succinctly be called sentient rights (9). Partially because of the predominance of nightmare scenarios envisioned by most science fiction authors and visionaries, we must consider the possibility our sentient creations may turn against us. Mostly because we cannot guarantee our sentient creations with the capacity of free-will will be amicable toward the human race, we strongly recommend we create our AA with built-in altruism (10). In essence, the AA proposed by this group will not have true free-will. They will be angelic-like creatures incapable of animosity *by design* .. This responsible mature approach toward AA assures us those nightmare scenarios cannot happen as long as we adhere *conscientiously* to this RF approach to AA. Therefore, we highly recommend all serious attempts at AA be performed within the RF.

The psychological functional terms required to define AA are actually simple and relate to our psychological intuitions quite nicely. We need: **short-term symbol registers** – we suggest 16 for various reasons (11), we need **long-term memory** which we suggest to be implemented most simply as English text records with as yet unspecified length in a database of 'mostly events' with associated time-stamps – these will be stored as they happen by an 'event recognizer' with similar capabilities as an 'object recognizer' – and critical feature of 'random access' such that any record is time-equivalent-retrievable regardless of its position in the database, in addition to events – there will be rules either taught directly to the AA – rules directly implanted in the DB by operators – or rules placed by the AA's 'rule generator' – specifications to be determined (this portion is obviously quite sophisticated and

considerable expertise is required to implement it), **senses**: we suggest digital analogs of vision and hearing – in addition to this – the AA must have accessible to it: 'raw sampled data' so that there is an intentional temporal correspondence between them (our human analog is: we can hear sounds and words 'simultaneously'; words are processed so fast by our language centers that we don't discriminate between words and the equivalent sounds; we don't have to create ultra-fast language processors; we simply delay the raw sampled data to coincide with the delay incurred by the speech-recognizer – of course, in order to avoid confusion with data in the visual domain, we need to delay those subsystems respectively), **visualization register**: the 3D analog of symbol registers – resolution is the key here to feasible implementation – if the resolution is too high – it becomes unimplementable – if too low – it becomes questionable in terms of utility, **identity**: we suggest this be placed as the first 'rule' in the DB so that there is no doubt as to its importance (even though access to each memory is equal) – this is a conservative approach, **connectivity**: how we connect the aforementioned components is critical to project success – timing, parallel processing, and bus-size – are also critical, and finally we suggest the component **dual-controller**: which is the explicitly synergistic item with specifications – one controller will have specifically *logical processing capability*, finite and explicit logical language plus the notion of set membership, set theory axioms listed in dependent order (12), and field relations regarding the rational numbers – the other controller will have *ideation capability* such that it balances the other controller in terms of creative solutions. This is obviously the core of the AA and what we most closely identify with the concept of mind. This is also the most difficult to implement. We suggest a recursive prototyping process similar to aircraft design: some will 'fly'; others will not; some will fly better than others. The final 'acid test' for awareness will be instantaneous mimicry (13).

Please forgive the complexity and any ambiguity perceived above. AI+AA is necessarily a complex endeavor. The parts relating to AI are: memory and associated sub-processors – and – shared with AA requirements – the dual-controller. AA requires: the registers, identity, connectivity, and shared with AI requirements – the dual-controller. So we see the dual-controller is indeed the core of the AI-AA. Of course, AI requires connectivity, but we feel the requirement is stronger for AA and therefore associate it conceptually with AA. Some theoreticians might suggest we associate the concept of mind with connectivity (14). However, we propose this is counterproductive in that no implementation benefit is provided with such a claim. When we specifically associate mind with dual-controller, we force ingenuity and synergy to be localized. This may cause some dismay within the community, but amounts to professional confidence in our design capabilities and confidence in the overall construct.

Some may misperceive this proposal as arrogant. We remind the skeptical reader achievements when at some time in history would have been regarded as impossible/magical: flight, GPS, lunar landings, television, cellphones, computers, and clean tap water. The other set of skeptics who might allow feasibility of the project, but reject it based on moral grounds are asked to reread (10) and (9). We feel this is the most respectful position possible: respectful toward our fellow human beings – and – respectful toward our sentient creations. We therefore consider this the most responsible position possible: designing explicitly altruistic AA-AI. Finally, this effort is seen as an attempt at general problem solving from a functional engineering standpoint: we're attempting to synthesize mind .. We respectfully ask for your confidence and encouragement in this historic effort. If there are any readers with constructive suggestions about any components or sub-processing capability, we ask you contact us at micheal(at)msu.edu .. The regenerative framework assures sustainability. It also assures synergy when properly applied. It is hoped this project will be an enduring testament to human ingenuity and the notion of regeneration.