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Title: Adaptive fault diagnosis using self-referential reasoning.

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Review text:

Imagine that we have launched a spaceship in the outer space with no human crew, and we have instructed processors to test each other. How can we detect from distance reliable processors from non-reliable ones? The author of the paper under review applies to identity faulty computers Smullyan's *Nelson Goodman Principles* that allows one to create "Yes or No" questions to deal with characters such as those who populates his well-known recreational puzzles, like Knights, who always tell the truth, Knaves, who always tell the false, and Normal, who sometimes tell the truth and sometimes lie (see R. Smullyan, Logical Labyrinths, A.K. Peters, Wellsley, MA, 2009; MR2474164). The said principle is used here to propose a unified approach to the question about how to divide a given set $\mathbf{I}$ of individuals into the set $\mathbf{R}$ of those who are reliable, and the set $\mathbf{U}$ of the unreliable ones. In particular, the aim is to find a solution which may work both if one follows the standard treatment and takes only those individuals who always tell the truth to be reliable, as well as if one takes the alternative route proposed by the author of the paper and allows also those who always lie to be equally regarded as reliable. The strategy is two-fold: on the one hand, it is based upon building "Yes or No" questions $Q(X, Y)$ to ask to individuals X about individuals Y, which are such that (a) a "Yes" answer implies that either $X \in \mathbf{U}$ or $Y \in \mathbf{R}$ and (b) a "No" answer implies that $X \in \mathbf{U}$ or $Y \in \mathbf{U}$; on the other hand, it uses questions $Q'(X, Y)$ such that (a') a "Yes" answer implies that $X \in \mathbf{U}$ or $Y \in \mathbf{U}$ and (b') a "No" answer implies that $X \in \mathbf{U}$ or $Y \in \mathbf{R}$. First it is shown that one element of

$\mathbf{R}$ can be found by asking $Q(X,Y)$ at most $n-b(n)$ times, where $n=|\mathbf{I}|$ and $b(n)$ is the number of 1s in the binary representation of n. Secondly, it is proved that one can identify all elements of $\mathbf{R}$ by asking $Q'(X,Y)$ at most $n+t$ times, where again $n=|\mathbf{I}|$ and, if $u=|\mathbf{U}|$, then $u \leq t < n/2$. The first result is obtained by adapting to the case here at stake the proof by S. Taschuk (see http://math.stackexchange.com/questions/115823). The second result uses a proof strategy sketched by P.M. Blecher (see On a logical problem, Discrete Math., 43, 1983, pp. 107-110; MR0680309).