Associate Editor's Report

Two of the three reviewers recommend that additional work is needed and that the paper should be re-reviewed again after that. In particular, the decomposition method needs more exposition and computational comparisons. Without both of these adequately addressed in the next version, the paper will need to be declined.

We are grateful to the referees for pointing out that the emphasis on the decomposition method as an exact approach was not appropriate. We agree with this point of view and we have consequently undertaken a significant revision. Its main modifications are as follows:

1. The section describing the P-E algorithm is now presented before the section on the decomposition method, to switch the main focus on the P-E algorithm (as suggested by referee 1).
2. The decomposition method is now presented as an auxiliary algorithm to the P-E heuristic. The theorem has been removed (we only mention the result in a short note at the end of the section).
3. The new section on the decomposition method contains a detailed description of the approach (with additional terminology), provides analogies to the standard concepts of intensification/diversification used in modern heuristic methods, and clarifies the role of cliques (as suggested by referee 2).

Given the emphasis on the P-E algorithm, we believe it is not necessary to provide computational comparisons on the performance of the decomposition algorithm alone. On the one hand, the decomposition approach has been specifically tailored to embed a heuristic method, hence comparing it to Babel's exact method appears unnecessary (*we do not claim that the decomposition algorithm is efficient as an exact method*). On the other hand, the results obtained by the combined P-E+Decomposition heuristic have already been compared to some of the best heuristic approaches, showing competitive performance.

Some other minor modifications:

1. We have removed the paragraph on Babel's algorithm at the end of Section 2. Instead, the relation between Babel's method and our decomposition algorithm is briefly mentioned at the end of Section 4.1.
2. Sections 3 and 4 have been divided into subsections to improve readability.
3. An acknowledgements section has been added.
4. A few references have been added.

Reviewer 1

I still recommend publication after changes. In my opinion the decomposition part is weak compared with other methods and a computational comparison or computational experiments with algo of babel should be considered. Main focus should be on p-e heuristic. Find at the end of the email short remarks for the authors.

As mentioned above, the focus is on the P-E heuristic and the decomposition method is now presented as an auxiliary algorithm. Therefore, we think it is not necessary to compare the decomposition algorithm (now viewed exclusively as a heuristic) with Babel's exact method.

On p.6, step 4: setminus should be \ instead of /

Done.

On p,6, proof: it should be explained why there must be an iteration, where the intersection between c^k and c^* is not empty.

The theorem and its proof have been removed.

I still believe it would be better to start with the P-E algorithm, since here the research focus can be found.

We agree and we have modified the order of the sections to reflect this recommendation.

The decomposition method appears to me too easy, compared to e.g. babel's approach, because it is a 1-level reduction only, and has little impact on the problem dimension. If the focus maintains on the decomposition, a recursive exact approach should be considered.

We agree with the referee, but since the focus is now on P-E, we believe it is not necessary to consider extensions to the decomposition algorithm to make it a better exact method.

I do think that the computational comparison with babel is in the scope of the article, because 1) the decomposition is very similar to babel's (except that babel uses recursion as well) and 2) babel is an indeed well working clique finding (and proving!) algorithm.

Since the decomposition algorithm is not meant to be used as an exact algorithm (opposed to Babel's), we feel it is not necessary to compare the two.

Reviewer 3

Even if the authors have taken into account most of my recommendation still the current version is not fully satisfactory. In fact, in my former report I had asked the authors to clarify the role played by cliques in the decomposition algorithm.

We rewrote the entire section on decomposition to improve the justifications and explanations concerning the basic ideas of the algorithm, specifically the role of cliques.

In fact, both in the decomposition algorithm as well as in the proof, one can substitute the (arbitrary) clique with any arbitrary set of vertices. This derives from the simple observation that, given a vertex i in V, if no improving clique is found in the graph G(i) (i.e. the graph induced by N(i)), then vertex i can be discarded. Actually, this observation is the basis of a standard branching.

The main advantage of removing cliques instead of any arbitrary set of vertices lies in the efficient implementation of a so-called safeguard mechanism (step 2' of the decomposition algorithm described in the previous version). This explanation has been added at the end of Section 3.1 of the revised version.

The authors seem to be partially aware of this relation in the (quite involved) comment added at the end of section 3. Also, the authors added a table of results at the end of Section 5 in order to show the effectiveness of their decomposition methodology, but no effort is made to justify such results. So, I invite the authors to revise again their paper in order to better clarify the role of the cliques in the decomposition method.

The comment at the end of Section 3 (now Section 4) has been removed. We mention in a short note at the end of Section 4.1 the relation between branching rules (such as those used in Babel's method) and our decomposition method. Also, by rewriting the entire section on decomposition, we clarify the role of cliques and we justify the effectiveness of the approach, corroborated by the results at the end of Section 5.