**Article focus: A brainstorming exercise**

In one or two sentences, answer each of the following questions. Please be sure that your answers are appropriate for a general audience.

1) Why is your field important?

Situations where a structure is moving under the influence of one or more liquids or gases, referred to as fluid-structure interactions (FSI), exist throughout science and engineering, and examples of such structures include wind turbines, aircraft, ships, heart valves and oil rigs. Engineers require simulation software tools which they can use to analyse the FSI experienced by these structures as part of the process of designing them, scientific research into how existing designs can be improved, or the exploration of entirely new designs.

2) What has already been studied in your field?

The fundamental physics of FSI have been studied for decades and are well understood, and a number of different numerical methods, in other words mathematical methods in which a computer is used to perform the required calculations, have been developed based on this understanding. Some of the numerical methods have been made available to the engineering and scientific communities in the form of commercial and open-source simulation software packages.

3) What has not been studied? Why is this gap significant?

Even when employing the most advanced numerical methods available, the time required to set up and run useful simulations of FSI is often long enough that it is infeasible to use these simulations as part of the engineering design process as it would negate the potential financial gains of delivering a better designed product. Therefore, there is a strong need to improve the numerical methods that are currently available so that they require less computation time and setup time, but are still capable of producing results that are accurate and detailed.

4) How does your research relate to this gap, and what is the goal of the current article? *Be sure to write a sentence that begins “The goal of this article is to […],” followed by a strong and specific verb (“propose,” “theorize,” “develop,” “investigate,” “discover”).*

My research has focused on developing an improved version of an existing type of numerical method used to simulate FSI, called a fictitious domain method, and making this new version available to the engineering and scientific communities by adding it to the open-source simulation software package, Fluidity. The goal of this article is to compare the performance of the new version of the fictitious domain method to the previous version that was already present in Fluidity, in order to demonstrate that it provides more accurate and detailed results in exchange for less setup and computation time.

5) What have you done, or what are you doing, to achieve this goal?

I have used both the new version of the fictitious domain method, which I have developed, and the previous version to conduct a series of simulations, known as benchmark simulations. I have used the data from these benchmark simulations to compare the performance of each of these methods and I am busy writing a draft paper which will present this data and my findings.

6) What is the working title of your article?

Comparative analysis between two different implementations of the fictitious domain method for simulating fluid-structure interactions: a distributed Lagrange multiplier approach versus a penalty approach.