A continuous passive motion (CPM) device can help with the formation of the acetabular cup with the femoral limb in the pelvis. However, in the current biomedical market, such a device with adequate freedom of motion is not available for infants with developmental delays of hip (DDH). With the physical therapy department as a $2.4 billion industry[2] and a projected 4% of children with DDH[1], there is increased awareness to help promote early intervention to reduce future complications. Without proper physical therapy, an impediment of hip dysplasia can occur, causing the individual to be completely wheelchair bound by the age of thirty-five. Therefore, the proposed venture involves designing a CPM that facilitates movement for infants with developmental delays and early onset symptoms of hip dysplasia. This will be accomplished by designing an electro-mechanical device that promotes movement of the legs to simulate the kinematics of crawling using an alternating displacement mechanism. The proposed motion will assist in the formation of the acetabular cup with femoral head into the ball-and-socket synovial joint. With the formation of the bone and acetabulum with continued use, the device will help the users to meet age-specific milestones. The patients will benefit from the CPM as a non-invasive treatment with better bone and joint alignment.

The device will be adjusted by the physical therapist to adapt to the size of the infant. The position of the brace can be altered accordingly along the horizontal axis in regard to the spacing of the platform to adhere to leg length of infants between the age of 8 months and 30 months. The mechanical system will be strapped on to the users' legs and alternating motion of the linear actuators will be powered using an AC wall plug. The actuators will be angled at both upright and outward of 45 degrees to eliminate the possibility of hip dislocation as the femur bone will be targeted into the hip bone with an acetabular index of approximately 22°[3] from the center surface of the acetabular head to the center of the developed hip bone. To provide additional support of the child's leg, Velcro straps will be attached to a thermoplastic polyethylene leg brace that is commonly used on children with orthopedic dysfunction. The goal of the capstone project is to provide a device in a safe and ethical manner to the biomedical device market. To ensure that the goal is met, the tangible prototype will undergo several verification testing using proper anatomical models as well as the OpenSim software to simulate motion.

1) https://www.understood.org/en/image-viewer?image=%2f~%2fmedia%2f248b58a8522f4930a0cb09de3ae1051a.png
2) http://www.usph.com/corporate/industry-overview.aspx
3) http://www.wheelessonline.com/ortho/radiographic_features_ddh