THE CLAIMS

What is claimed is:

1. A system for performing an arthroplasty surgery on a femur and tibia, the system comprising:

a robotic subsystem including a base, a support column having an upper end portion rotatable relative to the base, a main arm pivotally attached to the upper end portion of the support column and having an outer end portion, a secondary arm pivotally mounted to the outer end portion of the main arm and defining a longitudinal axis, a mounting section rotatable about the longitudinal axis and including a mounting flange rotatable about a mounting axis, motors and controls supported by the base, and a cutting tool mounted to the mounting section;

a navigation subsystem in communication with the robotic subsystem, the navigation subsystem including a plurality of reflective locating devices;

a control unit in communication with the robotic subsystem;

a display in communication with the control unit;

wherein the navigation subsystem is configured to provide the robotic subsystem, during the surgery, with information relating to positions of the femur and tibia thereby enabling separate tracking of the femur and tibia when the femur and tibia move during the surgery and the navigation subsystem is configured to cooperate with the robotic subsystem to determine a position of the cutting tool relative to the femur and tibia to guide movement of the cutting tool relative to the femur and tibia to cut away material from the femur and tibia,

wherein the control unit is configured to receive information relating to the position of the cutting tool relative to the femur and tibia such that movement of the cutting tool relative to the femur during the surgery is viewable on the display and movement of the cutting tool relative to the tibia during the surgery is viewable on the display, wherein the plurality of reflective locating devices includes a first plurality of reflective locating devices for attaching to the femur and a second plurality of reflective locating devices for attaching to the tibia;

an optically created guide including a three-dimensional image having visible light beams; and

a support assembly including a flat surface to engage a foot of a patient and a

pneumatically actuated piston and cylinder assembly operable to raise and lower the foot of the patient.

2. The system of claim 1, wherein the robotic subsystem further comprises:

a robotic mechanism including the main arm and the secondary arm acting as an adaptive arm, wherein the robotic mechanism is configured to perform the arthroplasty surgery without being coupled to an operating table,

wherein the cutting tool comprises an oscillating saw coupled to the robotic mechanism and configured to resect a portion of the tibia and the femur of the patient through a limited incision in the leg of the patient, the robotic mechanism configured to control movement of the saw during the resection;

a computer coupled to the robotic mechanism and configured to control the robotic mechanism, the robotic mechanism configured to position a prosthetic implant relative to at least one of the tibia and femur, wherein the prosthetic implant includes at least one of an implant bearing surface and an arcuate shape, and includes an ingrowth surface,

wherein at least one of the plurality of reflective locating devices is positionable through skin of the patient into engagement with tissue in the patient,

wherein the navigation subsystem includes an optical system coupled to the computer, the optical system configured to determine a location of at least one bone relative to other tissue in the patient, wherein the optical system is configured to provide location information of the at least one bone to the computer for use by the robotic mechanism;

an electric motor coupled to the robotic mechanism and the computer, the electric motor configured to facilitate movement of the robotic mechanism;

a position sensor configured to provide movement information of the prosthetic implant relative to at least one of the tibia and femur;

an adaptive arm interface coupled to the adaptive arm and the computer, the adaptive arm interface configured to operate the computer;

a force transmitting member coupled to the electric motor, the force transmitting member configured to enable implantation of the prosthetic implant into at least one of the tibia and femur,

wherein the robotic subsystem is configured to determine stability of a joint in which the

arthroplasty surgery is performed; and

at least one marker positionable on the body of the patient, the at least one marker configured to be detected by the robotic subsystem to provide location information, wherein the display is configured to provide imaging of the bone.

3. The system of claim 1, wherein the robotic subsystem further comprises:

a robotic mechanism, wherein the robotic mechanism is configured to perform the arthroplasty surgery without being coupled to an operating table;

wherein the cutting tool is coupled to the robotic mechanism and configured to resect a portion of a bone of the patient through a limited incision in the skin of the patient, the robotic mechanism configured to control movement of the cutting tool during the resection, wherein the bone is at least one of the femur and tibia;

a computer coupled to the robotic mechanism and configured to control the robotic mechanism, the robotic mechanism configured to position a prosthetic implant relative to the bone, wherein the prosthetic implant includes at least one of an implant bearing surface and an arcuate shape and includes an ingrowth surface,

wherein at least one of the plurality of reflective locating devices is positionable through skin of the patient into engagement with tissue in the patient,

wherein the navigation subsystem includes an optical system coupled to the computer, the optical system configured to determine the location of at least one bone relative to other tissue in the patient, wherein the optical system is configured to provide location information of the at least one bone to the computer for use by the robotic mechanism;

a position sensor configured to provide movement information of the robotic mechanism relative to the bone;

an interface coupled to the computer, the interface configured to operate the computer;

a motor configured to facilitate movement of the robotic mechanism;

a force transmitting member coupled to the motor, the force transmitting member configured to enable implantation of the prosthetic implant into the bone,

wherein the robotic subsystem is configured to determine stability of a joint in which the arthroplasty surgery is performed; and

at least one marker positionable on the body of the patient, the at least one marker

configured to be detected by the robotic subsystem to provide location information, wherein the display is configured to provide imaging of the bone.

4. The system of claim 1, wherein the robotic subsystem further comprises:

a robotic mechanism including the main arm and the secondary arm acting as an adaptive arm, the robotic mechanism configured to position a prosthetic implant relative to the bone through a limited incision in the skin of the patient, wherein the prosthetic implant includes an implant bearing surface, and a portion having an arcuate shape and includes an ingrowth surface;

a computer configured to control the robotic mechanism,

wherein at least one of the plurality of reflective locating devices is positionable through skin of the patient into engagement with tissue in the patient,

wherein the navigation subsystem includes an optical system coupled to the computer, the optical system configured to determine the location of at least one bone relative to other tissue in the patient, wherein the optical system is configured to provide location information of the at least one bone to the computer for use by the robotic mechanism;

a position sensor configured to provide movement information of the prosthetic implant relative to the bone;

an adaptive arm interface coupled to the adaptive arm and the computer, the adaptive arm interface configured to operate the computer, wherein the arthroplasty surgery is performed on a leg of the patient,

wherein the display is configured to provide imaging of the bone;

at least one marker positionable on the body of the patient, the at least one marker configured to be detected by the robotic subsystem to provide location information;

an electric motor coupled to the robotic mechanism and configured to move the robotic mechanism; and

a force measurement assembly coupled to the computer, the force measurement assembly configured to measure a resistance force.

5. The system of claim 1, wherein the robotic subsystem further comprises:

a robotic mechanism having a force transmitting member, wherein the robotic mechanism is configured to perform a surgical procedure without being coupled to an operating table;

a computer connected with the robotic mechanism,

wherein the navigation subsystem comprises:

an optical sensing system connected with the computer,

wherein the plurality of reflective locating devices are positionable through the skin of a patient into one or more tissues of the patient, wherein each of the plurality of reflective locating devices has a reflective end visible to the optical sensing system,

wherein the optical system is configured to determine location information of a bone relative to tissue based on at least one of the plurality of reflective locating devices, and

wherein the optical system is configured to provide the determined location information of the bone to the computer for use by the robotic mechanism;

the cutting tool configured to resect at least a portion of a joint surface of a bone in the patient, wherein the robotic mechanism is configured to control movement of the cutting tool during resection of the joint surface in preparation for receipt of an arthroplasty component,

wherein the force transmitting member of the robotic mechanism is configured to position the arthroplasty component in the body of the patient, to cover at least a portion of the resected joint surface; and

a position sensor connected with the force transmitting member and the computer, the position sensor configured to provide a position of the force transmitting member,

wherein the bone is at least one of the tibia, femur, or portion of a spine, wherein the joint is at least one of a shoulder, hip, knee, and spine, wherein the robotic mechanism is configured to check stability of the joint in at least one of flexion, extension, and rotation, wherein the computer is connected to the force transmitting member by a motor, and wherein the force transmitting member positions the arthroplasty component into the joint surface with a continuous insertion stroke.

6. The system of claim 1, wherein the robotic subsystem further comprises:

a robotic mechanism having a force transmitting member, wherein the robotic mechanism is configured to perform a surgical procedure without being coupled to an operating table;

a computer connected with the robotic mechanism,

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