

Refresher On .NET And Software Design Fundamentals For C

Sonar

SLAM for Structured Environments Using an Imaging Sonar. Springer Science & Business Media. ISBN 978-3-642-14039-6. Fahy, Frank (1998). Fundamentals of

Sonar (sound navigation and ranging or sonic navigation and ranging) is a technique that uses sound propagation (usually underwater, as in submarine navigation) to navigate, measure distances (ranging), communicate with or detect objects on or under the surface of the water, such as other vessels.

"Sonar" can refer to one of two types of technology: passive sonar means listening for the sound made by vessels; active sonar means emitting pulses of sounds and listening for echoes. Sonar may be used as a means of acoustic location and of measurement of the echo characteristics of "targets" in the water. Acoustic location in air was used before the introduction of radar. Sonar may also be used for robot navigation, and sodar (an upward-looking in-air sonar) is used for atmospheric investigations. The term sonar is also used for the equipment used to generate and receive the sound. The acoustic frequencies used in sonar systems vary from very low (infrasonic) to extremely high (ultrasonic). The study of underwater sound is known as underwater acoustics or hydroacoustics.

The first recorded use of the technique was in 1490 by Leonardo da Vinci, who used a tube inserted into the water to detect vessels by ear. It was developed during World War I to counter the growing threat of submarine warfare, with an operational passive sonar system in use by 1918. Modern active sonar systems use an acoustic transducer to generate a sound wave which is reflected from target objects.

Human factors in diving equipment design

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Human factors in diving equipment design are the influences of the interactions between the user and equipment in the design of diving equipment and diving support equipment. The underwater diver relies on various items of diving and support equipment to stay alive, healthy and reasonably comfortable and to perform planned tasks during a dive.

Divers vary considerably in anthropometric dimensions, physical strength, joint flexibility, and other factors. Diving equipment should be versatile and chosen to fit the diver, the environment, and the task. How well the overall design achieves a fit between equipment and diver can strongly influence its functionality. Diving support equipment is usually shared by a wide range of divers and must work for them all. When correct operation of equipment is critical to diver safety, it is desirable that different makes and models should work similarly to facilitate rapid familiarisation with new equipment. When this is not possible, additional training for the required skills may be necessary.

The most difficult stages for recreational divers are out of water activities and transitions between the water and the surface site, such as carrying equipment on shore, exiting from water to boat and shore, swimming on the surface, and putting on equipment. Safety and reliability, adjustability to fit the individual, performance, and simplicity were rated the most important features for diving equipment by recreational divers.

The professional diver is supported by a surface team, who are available to assist with the out-of-water activities to the extent necessary, to reduce the risk associated with them to a level acceptable in terms of the governing occupational safety and health regulations and codes of practice. This tends to make professional diving more expensive, and the cost tends to be passed on to the client.

Human factors engineering (HFE), also known as human factors and ergonomics, is the application of psychological and physiological principles to the engineering and design of equipment, procedures, processes, and systems. Primary goals of human factors engineering are to reduce human error, increase productivity and system availability, and enhance safety, health and comfort with a specific focus on the interaction between the human and equipment.

United States Army Special Forces selection and training

network and security. Module C – Communications Procedures: The module instructs the soldiers on basic communications fundamentals such as basic radio theory

The Special Forces Qualification Course (SFQC) or, informally, the Q Course is the initial formal training program for entry into the United States Army Special Forces. Phase I of the Q Course is Special Forces Assessment and Selection (SFAS). A candidate who is selected at the conclusion of SFAS will enable a candidate to continue to the next of the four phases. If a candidate successfully completes all phases they will graduate as a Special Forces qualified soldier and then, generally, be assigned to a 12-men Operational Detachment "A" (ODA), commonly known as an "A team." The length of the Q Course changes depending on the applicant's primary job field within Special Forces and their assigned foreign language capability but will usually last between 56 and 95 weeks.

Decompression equipment

use tables such as the RDP for a short time during training before moving on to use a diving computer. Decompression software such as Departure, DecoPlanner

There are several categories of decompression equipment used to help divers decompress, which is the process required to allow ambient pressure divers to return to the surface safely after spending time underwater at higher ambient pressures.

Decompression obligation for a given dive profile must be calculated and monitored to ensure that the risk of decompression sickness is controlled. Some equipment is specifically for these functions, both during planning before the dive and during the dive. Other equipment is used to mark the underwater position of the diver, as a position reference in low visibility or currents, or to assist the diver's ascent and control the depth.

Decompression may be shortened ("accelerated") by breathing an oxygen-rich "decompression gas" such as a nitrox blend or pure oxygen. The high partial pressure of oxygen in such decompression mixes produces the effect known as the oxygen window. This decompression gas is often carried by scuba divers in side-slung cylinders. Cave divers who can only return by a single route, can leave decompression gas cylinders attached to the guideline ("stage" or "drop cylinders") at the points where they will be used. Surface-supplied divers will have the composition of the breathing gas controlled at the gas panel.

Divers with long decompression obligations may be decompressed inside gas filled hyperbaric chambers in the water or at the surface, and in the extreme case, saturation divers are only decompressed at the end of a project, contract, or tour of duty that may be several weeks long.

Decompression practice

from the original (PDF) on 17 September 2021. Retrieved 29 November 2019. Jablonski, Jarrod (2006). Doing it Right: The Fundamentals of Better Diving. Global

To prevent or minimize decompression sickness, divers must properly plan and monitor decompression. Divers follow a decompression model to safely allow the release of excess inert gases dissolved in their body tissues, which accumulated as a result of breathing at ambient pressures greater than surface atmospheric pressure. Decompression models take into account variables such as depth and time of dive, breathing gasses, altitude, and equipment to develop appropriate procedures for safe ascent.

Decompression may be continuous or staged, where the ascent is interrupted by stops at regular depth intervals, but the entire ascent is part of the decompression, and ascent rate can be critical to harmless elimination of inert gas. What is commonly known as no-decompression diving, or more accurately no-stop decompression, relies on limiting ascent rate for avoidance of excessive bubble formation. Staged decompression may include deep stops depending on the theoretical model used for calculating the ascent schedule. Omission of decompression theoretically required for a dive profile exposes the diver to significantly higher risk of symptomatic decompression sickness, and in severe cases, serious injury or death. The risk is related to the severity of exposure and the level of supersaturation of tissues in the diver. Procedures for emergency management of omitted decompression and symptomatic decompression sickness have been published. These procedures are generally effective, but vary in effectiveness from case to case.

The procedures used for decompression depend on the mode of diving, the available equipment, the site and environment, and the actual dive profile. Standardized procedures have been developed which provide an acceptable level of risk in the circumstances for which they are appropriate. Different sets of procedures are used by commercial, military, scientific and recreational divers, though there is considerable overlap where similar equipment is used, and some concepts are common to all decompression procedures. In particular, all types of surface oriented diving benefited significantly from the acceptance of personal dive computers in the 1990s, which facilitated decompression practice and allowed more complex dive profiles at acceptable levels of risk.

Underwater acoustics

Sonar Performance Modeling. Berlin: Springer. p36 H. Medwin & C. S. Clay, Fundamentals of Acoustical Oceanography (Academic, Boston, 1998). D. E. Weston

Underwater acoustics (also known as hydroacoustics) is the study of the propagation of sound in water and the interaction of the mechanical waves that constitute sound with the water, its contents and its boundaries. The water may be in the ocean, a lake, a river or a tank. Typical frequencies associated with underwater acoustics are between 10 Hz and 1 MHz. The propagation of sound in the ocean at frequencies lower than 10 Hz is usually not possible without penetrating deep into the seabed, whereas frequencies above 1 MHz are rarely used because they are absorbed very quickly.

Hydroacoustics, using sonar technology, is most commonly used for monitoring of underwater physical and biological characteristics. Hydroacoustics can be used to detect the depth of a water body (bathymetry), as well as the presence or absence, abundance, distribution, size, and behavior of underwater plants and animals. Hydroacoustic sensing involves "passive acoustics" (listening for sounds) or active acoustics making a sound and listening for the echo, hence the common name for the device, echo sounder or echosounder.

There are a number of different causes of noise from shipping. These can be subdivided into those caused by the propeller, those caused by machinery, and those caused by the movement of the hull through the water. The relative importance of these three different categories will depend, amongst other things, on the ship type.

One of the main causes of hydro acoustic noise from fully submerged lifting surfaces is the unsteady separated turbulent flow near the surface's trailing edge that produces pressure fluctuations on the surface and unsteady oscillatory flow in the near wake. The relative motion between the surface and the ocean creates a turbulent boundary layer (TBL) that surrounds the surface. The noise is generated by the fluctuating velocity

and pressure fields within this TBL.

The field of underwater acoustics is closely related to a number of other fields of acoustic study, including sonar, transduction, signal processing, acoustical oceanography, bioacoustics, and physical acoustics.

List of diving equipment manufacturers

and other electronics for recreational diving. Open-source software dive computers. Heliox Technologies – Dive computers. Henderson (wetsuits) J. C.

Diving equipment, or underwater diving equipment, is equipment used by underwater divers to make diving activities possible, easier, safer and/or more comfortable. This may be equipment primarily intended for this purpose, or equipment intended for other purposes which is found to be suitable for diving use.

This is a list of manufacturers of equipment specifically intended for use for underwater diving, though they may also manufacture equipment for other applications

The fundamental item of diving equipment used by divers other than freedivers, is underwater breathing apparatus, such as scuba equipment, and surface-supplied diving equipment, but there are other important items of equipment that make diving safer, more convenient or more efficient. Diving equipment used by recreational scuba divers, also known as scuba gear, is mostly personal equipment carried by the diver, but professional divers, particularly when operating in the surface-supplied or saturation mode, use a large amount of diving support equipment not carried by the diver.

Equipment which is used for underwater work or other activities which is not directly related to the activity of diving, or which has not been designed or modified specifically for underwater use by divers is generally not considered to be diving equipment.

The list is laid out alphabetical order and lists types of diving equipment manufactured and brand names associated with each entity. Several brands were originally the names of independent manufacturers, which have subsequently changed ownership, and may be listed both as a brand and a manufacturer. Some manufacturers were only active for a few years, and some changed their name and brands several times. There are a few which accumulated others by mergers and purchases, and consequently own a large number of brands, some of which may then quietly disappear from the market.

Decompression theory

restricted to air. A fundamental problem in the design of decompression tables is that the simplified rules that govern a single dive and ascent do not apply

Decompression theory is the study and modelling of the transfer of the inert gas component of breathing gases from the gas in the lungs to the tissues and back during exposure to variations in ambient pressure. In the case of underwater diving and compressed air work, this mostly involves ambient pressures greater than the local surface pressure, but astronauts, high altitude mountaineers, and travellers in aircraft which are not pressurised to sea level pressure, are generally exposed to ambient pressures less than standard sea level atmospheric pressure. In all cases, the symptoms caused by decompression occur during or within a relatively short period of hours, or occasionally days, after a significant pressure reduction.

The term "decompression" derives from the reduction in ambient pressure experienced by the organism and refers to both the reduction in pressure and the process of allowing dissolved inert gases to be eliminated from the tissues during and after this reduction in pressure. The uptake of gas by the tissues is in the dissolved state, and elimination also requires the gas to be dissolved, however a sufficient reduction in ambient pressure may cause bubble formation in the tissues, which can lead to tissue damage and the symptoms known as decompression sickness, and also delays the elimination of the gas.

Decompression modeling attempts to explain and predict the mechanism of gas elimination and bubble formation within the organism during and after changes in ambient pressure, and provides mathematical models which attempt to predict acceptably low risk and reasonably practicable procedures for decompression in the field. Both deterministic and probabilistic models have been used, and are still in use.

Efficient decompression requires the diver to ascend fast enough to establish as high a decompression gradient, in as many tissues, as safely possible, without provoking the development of symptomatic bubbles. This is facilitated by the highest acceptably safe oxygen partial pressure in the breathing gas, and avoiding gas changes that could cause counterdiffusion bubble formation or growth. The development of schedules that are both safe and efficient has been complicated by the large number of variables and uncertainties, including personal variation in response under varying environmental conditions and workload.

History of scuba diving

risk, which increases with depth, and the available systems for mixed gas rebreathers were fairly bulky and designed for use with diving helmets. The first

The history of scuba diving is closely linked with the history of diving equipment. By the turn of the twentieth century, two basic architectures for underwater breathing apparatus had been pioneered; open-circuit surface supplied equipment where the diver's exhaled gas is vented directly into the water, and closed-circuit breathing apparatus where the diver's carbon dioxide is filtered from the exhaled breathing gas, which is then recirculated, and more gas added to replenish the oxygen content. Closed circuit equipment was more easily adapted to scuba in the absence of reliable, portable, and economical high pressure gas storage vessels. By the mid-twentieth century, high pressure cylinders were available and two systems for scuba had emerged: open-circuit scuba where the diver's exhaled breath is vented directly into the water, and closed-circuit scuba where the carbon dioxide is removed from the diver's exhaled breath which has oxygen added and is recirculated. Oxygen rebreathers are severely depth limited due to oxygen toxicity risk, which increases with depth, and the available systems for mixed gas rebreathers were fairly bulky and designed for use with diving helmets. The first commercially practical scuba rebreather was designed and built by the diving engineer Henry Fleuss in 1878, while working for Siebe Gorman in London. His self contained breathing apparatus consisted of a rubber mask connected to a breathing bag, with an estimated 50–60% oxygen supplied from a copper tank and carbon dioxide scrubbed by passing it through a bundle of rope yarn soaked in a solution of caustic potash. During the 1930s and all through World War II, the British, Italians and Germans developed and extensively used oxygen rebreathers to equip the first frogmen. In the U.S. Major Christian J. Lambertsen invented a free-swimming oxygen rebreather. In 1952 he patented a modification of his apparatus, this time named SCUBA, an acronym for "self-contained underwater breathing apparatus," which became the generic English word for autonomous breathing equipment for diving, and later for the activity using the equipment. After World War II, military frogmen continued to use rebreathers since they do not make bubbles which would give away the presence of the divers. The high percentage of oxygen used by these early rebreather systems limited the depth at which they could be used due to the risk of convulsions caused by acute oxygen toxicity.

Although a working demand regulator system had been invented in 1864 by Auguste Denayrouze and Benoît Rouquayrol, the first open-circuit scuba system developed in 1925 by Yves Le Prieur in France was a manually adjusted free-flow system with a low endurance, which limited the practical usefulness of the system. In 1942, during the German occupation of France, Jacques-Yves Cousteau and Émile Gagnan designed the first successful and safe open-circuit scuba, a twin hose system known as the Aqua-Lung. Their system combined an improved demand regulator with high-pressure air tanks. This was patented in 1945. To sell his regulator in English-speaking countries Cousteau registered the Aqua-Lung trademark, which was first licensed to the U.S. Divers company, and in 1948 to Siebe Gorman of England.

Early scuba sets were usually provided with a plain harness of shoulder straps and waist belt. Many harnesses did not have a backplate, and the cylinders rested directly against the diver's back. Early scuba divers dived

without a buoyancy aid. In an emergency they had to jettison their weights. In the 1960s adjustable buoyancy life jackets (ABLJ) became available, which can be used to compensate for loss of buoyancy at depth due to compression of the neoprene wetsuit and as a lifejacket that will hold an unconscious diver face-upwards at the surface. The first versions were inflated from a small disposable carbon dioxide cylinder, later with a small direct coupled air cylinder. A low-pressure feed from the regulator first-stage to an inflation/deflation valve unit an oral inflation valve and a dump valve lets the volume of the ABLJ be controlled as a buoyancy aid. In 1971 the stabilizer jacket was introduced by ScubaPro. This class of buoyancy aid is known as a buoyancy control device or buoyancy compensator. A backplate and wing is an alternative configuration of scuba harness with a buoyancy compensation bladder known as a "wing" mounted behind the diver, sandwiched between the backplate and the cylinder or cylinders. This arrangement became popular with cave divers making long or deep dives, who needed to carry several extra cylinders, as it clears the front and sides of the diver for other equipment to be attached in the region where it is easily accessible. Sidemount is a scuba diving equipment configuration which has basic scuba sets, each comprising a single cylinder with a dedicated regulator and pressure gauge, mounted alongside the diver, clipped to the harness below the shoulders and along the hips, instead of on the back of the diver. It originated as a configuration for advanced cave diving, as it facilitates penetration of tight sections of cave, as sets can be easily removed and remounted when necessary. Sidemount diving has grown in popularity within the technical diving community for general decompression diving, and has become a popular specialty for recreational diving.

In the 1950s the United States Navy (USN) documented procedures for military use of what is now called nitrox, and in 1970, Morgan Wells, of NOAA, began instituting diving procedures for oxygen-enriched air. In 1979 NOAA published procedures for the scientific use of nitrox in the NOAA Diving Manual. In 1985 IAND (International Association of Nitrox Divers) began teaching nitrox use for recreational diving. After initial resistance by some agencies, the use of a single nitrox mixture has become part of recreational diving, and multiple gas mixtures are common in technical diving to reduce overall decompression time. Oxygen toxicity limits the depth when breathing nitrox mixtures. In 1924 the U.S. Navy started to investigate the possibility of using helium and after animal experiments, human subjects breathing heliox 20/80 (20% oxygen, 80% helium) were successfully decompressed from deep dives, Cave divers started using trimix to allow deeper dives and it was used extensively in the 1987 Wakulla Springs Project and spread to the north-east American wreck diving community. The challenges of deeper dives and longer penetrations and the large amounts of breathing gas necessary for these dive profiles and ready availability of oxygen sensing cells beginning in the late 1980s led to a resurgence of interest in rebreather diving. By accurately measuring the partial pressure of oxygen, it became possible to maintain and accurately monitor a breathable gas mixture in the loop at any depth. In the mid-1990s semi-closed circuit rebreathers became available for the recreational scuba market, followed by closed circuit rebreathers around the turn of the millennium. Rebreathers are currently (2018) manufactured for the military, technical and recreational scuba markets.

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